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CONSIDERATION OF WAYS AND MEANS OF COMMEMORATING IN 1999 THE TWENTIETH ANNIVERSARY OF THE VIENNA CONFERENCE ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

Note by the UNCTAD secretariat

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INTRODUCTION

1. At its July 1995 session, the Economic and Social Council invited the Commission on Science and Technology for Development (CSTD) in resolution 1995/4 "to give consideration to ways and means of taking advantage of the twentieth anniversary of the United Nations Conference on Science and Technology for Development, held in Vienna from 20 to 31 August 1979, to formulate a common vision for the future contribution of science and technology for development". The Commission on Science and Technology for Development is expected to examine this issue, which is the subject of the present note submitted by the secretariat, under item 5 of the provisional agenda of its third session.

2. The purpose of the note is to initiate and facilitate discussions on preparatory activities for formulating a common vision for the future contribution of science and technology for development. This note sets out the background to the evolution of thinking on science and technology from 1963, the date of the first international Conference, up to the 1979 Vienna Conference and on the issues that have emerged in the 1990s. More specifically, it briefly reviews some of the work done during the pre- and post-Vienna Conference periods as well as its underlying concepts, and raises science and technology-related issues that could be brought to the attention of the international community for its consideration in the years ahead.[1]

3. Pursuant to a recommendation of the Bureau of the CSTD, the secretariat convened a panel meeting in Geneva (20-21 December 1996) with the participation of those members of the Commission who had expressed their interest in formulating a common vision for the future. This was done with a view to discussing how to implement the ECOSOC resolution on that matter. The meeting was expected to review past endeavours for the diffusion of science and technology throughout the world, to draw some lessons from them - their successes and failures - and to discuss new approaches in this area. The participants were Mr. Robert Boroffice (Nigeria), Mr. Bernd-Michael Rode (Austria), Mr. Arnoldo Ventura (Jamaica) and Mr. George Waardenburg (Netherlands). A draft version of the present note was made available to the meeting and subsequently sent to all members of the CSTD Bureau.[2]

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[1] In this connection, it should be noted that many agencies of the United Nations system have played an active role in this process and continue to make considerable efforts to promote science and technology within their specific fields — for example, the FAO with regard to agricultural technologies, WHO with regard to health technologies, UNESCO with regard to cooperation between developed and developing countries in many scientific disciplines, and UNIDO with regard to industrialization.

[2] A report on the panel meeting is being brought to the attention of the CSTD members as a conference room paper. See "Consideration of ways and means of commemorating in 1999 the twentieth anniversary of the Vienna Conference on Science and Technology for Development. Report by the UNCTAD secretariat on the Panel Meeting" (E/CN.16/1997/CRP.2).

4. The secretariat is grateful to the following experts and Commission members for providing valuable comments on the draft version of this report: Mr. Titus Adeboye, Executive Director, African Technology Policy Studies Network, Kenya; Mr. Carlos Aguirre, Academia Nacional de Ciencias de Bolivia, Bolivia; Mr. Carlos M. Correa, Director, Maestría en Política y Gestión, Ciencia y Tecnología, Centro de Estudios Avanzados, University of Buenos Aires, Argentina; Mr. Messanvi Gbeassor, Doyen, Faculté des Sciences, Université du Bénin, Togo; Mr. Mohd Nordin Hj. Hasan, Institute for Environment and Development (LESTARI), Malaysia; Mr. Sándor Hidas and Ms. Eva Sztankó, Ministry of Industry and Trade, Hungary; Ms. Julia Marton-Lefèvre, Executive Director, International Council of Scientific Unions, France; Mr. Jörg Meyer-Stamer, German Development Institute, Germany; Mr. Masafumi Nagao, Sasakawa Peace Foundation, Japan; Mr. Surendra J. Patel, Director, Institute on Equity and Development, India; Mr. Klaus-Heinrich Standke, President, Internationale Akademie Schloss Baruth, Germany; and Mr. George Waardenburg, Ministry of Foreign Affairs, Netherlands, and Chairman of the CSTD. Although the full extent of the different views could not be reflected here, all the comments made helped shape the final version of this document.

PART A: FROM GENEVA TO VIENNA: APPROACHES TO SCIENCE AND TECHNOLOGY

5. The global nature of science and technology has long been acknowledged. The League of Nations made an early effort to promote international cooperation in this area through its Committee on Intellectual Cooperation; and the scientific community itself established the International Council of Scientific Unions (ICSU) in 1931. Moreover, the role of science and technology has been of concern to the Member States of the United Nations as a form of support for the developing nations' quest for balanced social and economic development. This is in keeping with the overall goal set out in the United Nations Charter, namely "to promote social progress and better standards of life". It was clear to the founding members of the United Nations after the Second World War that peaceful and friendly relations among nations required general conditions of economic well-being. The political, economic and technological environment has changed considerably since those early days, however. Most developing countries have become independent nations and joined the United Nations community; the East-West dichotomy that dominated world politics for decades has ceased to exist; and globalization of production, markets and technologies has brought new challenges. *But how well has the international community adjusted its thinking, development approaches and policies to those trends?*

I. SCIENCE AND TECHNOLOGY AS "PROGRESS": THE UNITED NATIONS CONFERENCE ON THE APPLICATION OF SCIENCE AND TECHNOLOGY FOR THE BENEFIT OF THE LESS DEVELOPED AREAS (GENEVA, 1963)

6. The importance of international cooperation in science and technology as one of the elements that could contribute to economic development was emphasized as early as 1949 by the United Nations Scientific Conference on the Conservation and Utilization of Resources, held at Lake Success, New York. The 1950s saw the United Nations addressing the peaceful uses of atomic energy and other specialized areas related to technology. For a long time a *Scientific Advisory Committee* provided advice to Secretary-Generals of the United Nations. In 1961, the Economic and Social Council (ECOSOC) decided that an international technical conference of Governments should be held under the United Nations auspices to explore the application of science and technology for the benefit of the less developed areas. The aim of the conference, which was held in Geneva in 1963, was to demonstrate the means of accelerating development through the application of the latest advances in science and technology. Like scientific congresses, the conference had no authority to take any binding decisions. Its outcome was the conviction that a new and sustained effort was needed to facilitate the transfer of science and technology to developing countries and to help them overcome obstacles to access to knowledge and its application. However, no specific action was taken in this regard. "Geneva" was mainly a technical conference and some critics later compared it to a "science fair". It largely reflected the undiminished techno-optimism of its time. The underlying concept of "Geneva" was that technological progress equalled development. Even in 1963, Secretary-General U Thant included some words of caution in his foreword to the Geneva conference proceedings: applied science could be a powerful force for

raising living standards "*if the Governments and people of the world can find the means and the will*".[3]

7. As a result of the conference, ECOSOC established an Advisory Committee on the Application of Science and Technology for Development (ACAST), which met on a regular basis for 16 years, providing advice for ECOSOC's substantive work, supported by a small Office for Science and Technology within the United Nations secretariat. ACAST consisted of individual experts selected in their personal capacity, many of whom belonged to academies of sciences and national research councils in their own countries. Its objective was to develop a strategy for the role of science and technology in development and to give greater impetus to the application of science and technology in United Nations programmes. In 1971, ACAST submitted a *World Plan of Action for the Application of Science and Technology for Development* highlighting such issues as the need for indigenous capacity-building, the gap between the potential of science and technology and the extent of the latter's actual use, the weakness of scientific institutions in the developing world, the problem of access to the world's technology, and the brain drain. However, since it was a group of experts with no direct access to the political decision-making process, ACAST had a limited impact. During the early 1970s, ECOSOC established a Committee on Science and Technology for Development which provided a special political forum for the results of ACAST's work within the United Nations and brought the discussion to a more political level. The new Committee addressed issues ranging from capacity-building to technology transfer and the development of an international technological information system. Already at its second session in 1974, it addressed the possibility of holding another major United Nations conference in the area of science and technology for development.[4]

II. SCIENCE AND TECHNOLOGY IN A "NORTH-SOUTH" CONTEXT: THE UNITED NATIONS CONFERENCE ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT (VIENNA, 1979)

8. Throughout the 1970s, developing countries, particularly the least developed countries, called for better access to the world's stock of science and technology. In response to these calls and growing disagreements between "North" and "South" over such matters, the General Assembly took up in 1976 the proposal by ECOSOC and its Committee on Science and Technology for Development that a second global conference on science and technology be held. This conference involved several years of substantive preparations, regional review meetings and the participation of a large number of non-governmental organizations (NGOs).

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[3] "Report of the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas", 8 vols., Vol. 1 (New York, 1963), p. vii. For further details on this and on the developments described below, see K.-H. Standke and M. Anandakrishnan (eds.), *Science, Technology and Society: Needs, Challenges and Limitations,* (New York: Pergamon Press, 1980).

[4] United Nations, Committee on Science and Technology for Development, "Report on the second session (11-29 March 1974)" (E/5473, E/C.8/27). For its part, UNCTAD had set up in 1971 an intergovernmental working group concerned with the transfer of technology to the developing countries. For details, see part B of the present document.

Each Member State provided a national paper on the status of science and technology. This fact alone provided an unprecedented "package" of information on the state and diffusion of science and technology throughout the world. In August 1979 the United Nations convened the Conference on Science and Technology for Development (UNCSTD) in Vienna. The Vienna Programme of Action[5] adopted by the Conference addressed three major areas: (i) strengthening the science and technology capacities of the developing countries; (ii) restructuring the existing pattern of international scientific and technological relations in the transfer of technology; and (iii) strengthening the role of the United Nations system in promoting new ways of technology cooperation as well as considerably increasing the provision of financial resources for such purposes.

9. In view of the growing gaps in the area of science and technology between developed and developing countries, the techno-optimism of the 1950s and early 1960s could no longer be sustained, and "Vienna" was a conference about equitable access to the world's technology. It reflected an awareness that issues of international science policy related to economic wealth and access to know-how and technologies. The focus of the conference was political rather than technical and it put science and technology in the context of "North-South" relations. It was the last of the United Nations "mega conferences" of the 1970s addressing issues relating to a new international economic order.[6]

10. The institutional arrangements that were set up after "Vienna" were marked by the creation of a political body - an intergovernmental committee of the United Nations General Assembly - and a separate financing mechanism for funding science and technology projects through voluntary contributions by the industrialized countries.[7] Theoretically, the new committee was a powerful political body in the area of international science and technology policy because it was open to all Member States and reported to the General Assembly. However, it never had any substantial financial means at its disposal and active participation by Member States declined over the years following the initial momentum created by the conference. The Financing System,[8] on the other hand, depended on the voluntary contributions of donor countries, and eventually became an integrated unit of the

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[5]United Nations, "The Vienna Programme of Action on Science and Technology for Development", 1979.

[6]For a critical review of "Vienna" and the process leading up to it, see D. Dickson, *The New Politics of Science* (New York: Pantheon, 1984).

[7]The ECOSOC Committee on Science and Technology for Development was to be open to all Member States in the form of a new Intergovernmental Committee (IGC, serviced by a secretariat, namely the United Nations Centre for Science and Technology for Development). ACAST was replaced by a new Advisory Committee on Science and Technology for Development (ACSTD). In addition, an Interagency Task Force on Science and Technology for Development was established to facilitate a coordinated approach among different agencies.

[8]Later renamed United Nations Fund for Science and Technology for Development (UNFSTD).

United Nations Development Programme. During most of the lifetime of these two institutional arrangements, the policies chosen by the IGC and the projects funded by the Financing System remained separate.

III. THE LESSONS OF "VIENNA"

11. It was the impression at "Vienna" that "Geneva's" reliance solely on technical progress had not brought about much change in the developing world in terms of technological capacity-building. Moreover, the pattern of failed technology transfer projects was world-wide. As a result, the underlying concept of "Vienna" was that concerted governmental action at both international and national levels was required in order to build up endogenous capacities within developing countries.

12. The intergovernmental machinery established after "Vienna" produced a substantial number of relevant reports on technology issues, providing advice to the international community, but did not achieve a major breakthrough in developing countries' participation in the use of the world's science and technology. Furthermore, it never generated the amount of funding that had been agreed upon at "Vienna". The mounting debt crisis in many developing countries throughout the 1980s, moreover, had a negative impact on the dwindling resources within the developing world itself.

13. In preparation for the tenth anniversary of "Vienna", there were several attempts - in 1988 and 1989 - to make a critical assessment of progress in the implementation of the Vienna Programme of Action on Science and Technology for Development: expert group meetings were organized by the IGC's secretariat (the Centre for Science and Technology for Development) as an "end-of-decade-review", by UNESCO and by the Stanley Foundation. Furthermore, the 44th session of the General Assembly in 1989 discussed the implementation of the Vienna Programme of Action.

14. The evaluation carried out at a series of regional and global meetings organized by the Centre for Science and Technology for Development identified the building of endogenous capacities in developing countries as a key element of policies and programmes. The involvement of a broad set of stakeholders was seen as necessary in this process and policy dialogues at various levels were seen as a tool to identify the specific needs of individual countries.[9]

15. The evaluation carried out by UNESCO took a more traditional approach by including reviews of the progress made since "Vienna" within specific scientific areas, ranging from basic sciences to earth and water sciences. Human resources

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[9]Centre for Science and Technology for Development, "State of science and technology for development in the world: Options for the future", background document for the Intergovernmental Committee on Science and Technology for Development, tenth session, New York, 1989. See also an earlier document: German Foundation for International Development and Centre for Science and Technology for Development, "International cooperation in science and technology for development: Future options" (Bonn and New York, 1989).

development and international cooperation in scientific and technological research were the central concern of this evaluation.[10]

16. Neither of the above evaluations questioned the continued validity of the Vienna Programme of Action. A far more critical evaluation was conducted by the Stanley Foundation, which brought together a small group of representatives from a number of American institutions dealing with science policy issues, senior United Nations staff and selected diplomats from United Nations missions in New York. This evaluation detected flaws from the outset in the Vienna Programme of Action itself, whose "broad terms and blurred definitions" masked existing disagreements.[11] It identified a number of additional obstacles that stood in the way of efficient implementation of the Vienna Programme of Action, ranging from "bureaucratic jealousies" among agencies, each of which tried to protect its own science and technology-related programmes, to an environment characterized by a shortage of funds. However, participants in the evaluation saw an important role to be played by multilateral approaches in this area. The process of implementing the Vienna Programme of Action would have to "involve the real actors engaged in generating and using science and technology. This includes scientists and engineers and private enterprises, including transnational corporations which produce goods and services developed by the scientific and technological community". Multilateral institutions in science and technology had to face challenges and opportunities in coping with "global change that defies strictly national or private approaches to management".

17. Furthermore, the General Assembly of the United Nations, at its forty-fourth session in 1989, noted "with great concern that the effect of increasing disparities in scientific and technological capabilities between the industrialized and the developing countries as a whole has been to contribute to a widening of the economic gap between them". In this context, it reaffirmed the validity of the Vienna Programme of Action and expressed concern regarding its implementation.[12]

18. All four evaluations contained interesting ideas. However, the fundamental changes that characterize today's economic realities, namely economic liberalization, the accelerated speed of globalization following the end of the East-West dichotomy and the opening of developing countries' markets, were only just emerging when these evaluations of the Vienna Conference were conducted. Thus, the full impact of these realities could not be taken into account by the

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[10]UNESCO, "Science and technology for the future: A fresh look at international cooperation in science and technology" (Paris, 1989).

[11]For this quotation and the subsequent ones, see Stanley Foundation, *Science and Technology for Development: 19th UN Issues Conference* (Muscatine, Iowa, 1988).

[12]Resolution 44/14, Implementation of the Vienna Programme of Action on Science and Technology for Development, Section A of the resolution, End-of-Decade Review of the Vienna Programme of Action on Science and Technology for Development and its Revitalization, 42nd plenary meeting, 26 October 1989. See Official Records of the General Assembly, Forty-fourth Session, Supplement No. 37 (A/44/37), p. 21.

early assessments. In the years that followed, these realities changed the national and international contexts considerably.

19. Over 30 years after Secretary-General U Thant called attention to the need for the Governments and people of the world to find "the means and the will" to ensure the successful application of "science and technology for development", it has to be concluded that the means found to implement the Vienna Programme of Action were inadequate, and that those who actually had the political will to give effect to the programme had limited access to the necessary resources. Beyond that perception one might want to look at the programmes and approaches chosen and determine why these were unable to attract the necessary means and bring about a true consensus between North and South, and how future programmes might avoid such problems. The fact that both the "technological fix" aimed at by "Geneva" and the "policy fix" implicit in the Vienna Programme of Action did not lead to the expected changes is suggestive of the complexities involved in such a process.

20. Any approach to science and technology now would have to depart from the largely state-led approach of "Vienna". It would have to take into account a broad range of concerns of actors and stakeholders in development, including Governments, enterprises, the scientific and research and development (R&D) community, and NGOs. A combination of effective national policies and international cooperation needs to be pursued. There is a general awareness today that development, especially in a field as complex as science and technology, is not a linear process which results from purely economic measures or blueprints, and that the adaptation and adoption of technology are always embedded in the culture, politics, history and productive system of countries. There is also an awareness that science and technology could play an important role in the process of development, as was the case in countries that have undergone a successful economic transformation.

21. The debate continues. Thus, the United Nations General Assembly, at its forty-eighth session in 1993,[11] reaffirmed the principles of the Vienna Programme of Action for striving to strengthen science and technology in the developing world, since almost two decades after the Vienna Conference, the Programme's aspiration to a more equitable diffusion of science and technology throughout the world remains largely unfulfilled. Furthermore, 13 years after the Vienna Conference one of the key issues at the United Nations Conference on Environment and Development, held in Rio de Janeiro in 1992, was taken from the unresolved agenda of "Vienna": technology cooperation and the access of developing countries to the industrialized world's advanced technology. Moreover, all agreements at the Rio Conference contain some provisions regarding science and technology. For example, chapter 34 of *Agenda 21* is devoted to the transfer of environmentally sound technologies, cooperation and capacity-building, while chapter 35 deals with the role of science in sustainable development. This has given a new momentum to the discussion of international cooperation in this field. Today, environmentally sound technologies are a test case of technology cooperation for the international community, including Governments, enterprises and development cooperation agencies, given the urgency of global environmental change and the

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[11] See General Assembly resolution 48/179, Science and Technology for Development, 21 December 1993.

agreements reached at the Rio Conference. Thus, science and technology can play an important role in the long-term global search for balance among the three objectives — development, equity and environment.

22. In summary, new paradigms have emerged with regard to science and technology responding to the challenges of new technologies, changes in the international political climate and the deliberations at the Rio Conference. These reflect a growing awareness of the interrelationship between economic development and ecological sustainability, concern for creating an enabling environment that provides room for enterprise development, and an unprecedented level of global interdependence. A number of new attempts are under way that aim at reviving efforts for technology cooperation between developed and developing countries. These efforts mobilize private enterprises more directly and concentrate on promoting inter-firm cooperation, including the identification of elements likely to build a suitable framework or enabling environment for such cooperation. The scientific community (according to the "Geneva approach") and Governments (according to the "Vienna" approach) are no longer seen as the sole actors in the development of science and technology, for a more complex scenario is emerging that involves a multitude of "stakeholders". At the same time, some of the unresolved issues of the Vienna Conference remain on the agenda.

PART B: THE EVOLUTION OF DEVELOPMENT THINKING IN SCIENCE AND TECHNOLOGY: THE CASE OF UNCTAD

23. This section highlights the evolution of major conceptual approaches in the development thinking in science and technology since the early 1970s. Together with other organizations and bodies of the United Nations system, UNCTAD had actively participated in the substantive preparations for the Vienna Conference and elucidated major issues which Governments considered in the elaboration of the Programme of Action. The Committee on Transfer of Technology had been established in UNCTAD in 1974 and contributed to this endeavour. In the early 1990s, the "Vienna" institutions - the IGC, the ACSTD and the Interagency Task Force - were abolished and a new, functional ECOSOC Commission on Science and Technology for Development was established, with UNCTAD becoming its secretariat in 1993.

24. This section provides a selective account of the work done by UNCTAD in the process up leading to "Vienna" and in the post-Vienna efforts concerned with building scientific and technological capacities in the developing world. It thus illustrates the changing paradigms which have shaped work programmes and debates over the past 15 years.

I. ANALYSIS OF TECHNOLOGY TRANSFER ISSUES, TRADE AND DEVELOPMENT IMPLICATIONS OF NEW TECHNOLOGIES AND TRENDS IN INTERNATIONAL TECHNOLOGY FLOWS (1970-1991)

25. The establishment of UNCTAD in 1964, and the setting up in 1970 of the Intergovernmental Group on Transfer of Technology, helped to create awareness and stimulated intergovernmental discussions on technology-related issues. In 1974, the Trade and Development Board transformed the Group on Transfer of Technology into the Committee on Transfer of Technology (CTT). During the 1970s, the Committee focused on issues related to the transfer of technology, including terms and conditions for such transfer, reflecting a major preoccupation of developing

countries with improving access to foreign technology and ways and means of acquiring it at fairer prices and on fairer conditions. As at the discussions in Vienna, these issues related to the asymmetries between developed and developing countries in the market for technology; and the need to reduce the imbalance in the bargaining position of the parties to the transfer of technology contracts was also considered. This subsequently led to the launching of negotiations on an international code of conduct on the transfer of technology. In the early 1980s, the Committee's work included the identification of specific measures for strengthening the technological capacity of developing countries, leading to the formulation and implementation of a strategy for technological transformation.

26. In the second half of the 1980s and up to 1991, UNCTAD's work on technology was mostly concerned with the extent to which technological change impacts on trade and development, particularly of developing countries, and the ways in which this impact manifests itself. UNCTAD considered the effects of technological change on raw-material consumption, pointing out that materials substitution and materials saving arising from technological change had contributed to the "dematerialization"[14] of production that has adversely affected the export performance of many producers of primary commodities in developing countries. In the area of manufactures, discussions within UNCTAD centred on the diffusion of technological advances, particularly those brought about by micro-electronics, and their effects on trade and development. These effects included quality improvements, cost reductions and product development, and have contributed to making the comparative advantage of labour cost a relatively less important determinant of competitiveness. In the services sector, work concentrated on reviewing technological change and its trade implications in different service industries, including transportation, banking, construction, telecommunication and computer services. UNCTAD also monitored trends in international technology flows, including their developmental implications, and considered measures to stimulate those flows, particularly to developing countries.

II. INTERRELATIONSHIPS BETWEEN INVESTMENT AND TECHNOLOGY TRANSFER (1992-1994)

27. In 1992, the eighth session of UNCTAD marked an important change in the scope and orientation of the organization's work. It laid the foundations of national and international policies aimed at enhancing the development prospects of all countries, particularly those of developing countries. This was reflected in the document which the Conference adopted — "A New Partnership for Development: The Cartagena Commitment" — which considers consensus building to be a key function of UNCTAD. Sharing of experiences, perceptions and views forms an integral part of this process. It calls *inter alia* for closer cooperation with external actors, especially non-governmental organizations and the enterprise sector. Technology issues were addressed relative to their interrelationship with trade in goods and services, investment, finance and environment. Consequently,

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[14] "Dematerialization" of production refers to a shift in the composition of demand in the industrialized countries away from intensely raw-material-consuming industries and to a diminution in the intensity of materials use in existing manufacturing industries.

the Committee on Transfer of Technology was suspended and a new Ad Hoc Working Group on the Interrelationship between Investment and Technology Transfer was created, which completed its work in March 1994.

28. Activities carried out by that Ad Hoc Working Group focused on the interrelated areas of investment, technology transfer, capacity-building and competitiveness. Attention was also directed to improving the understanding of how environmental considerations, including the generation and use of environmentally sound technologies, affect the investment and technology policies of countries and firms. More specifically, the activities carried out initially centred on the evolution of investment and technology flows to different countries and on the main factors that affect these flows. The work done showed that after a period of stagnation, investment flows to a number of developing countries expanded. However, only a handful of developing countries were able to attract significant flows of foreign direct investment (FDI), while over 100 developing countries received less than 1 per cent of the world's FDI flows.

29. Among the factors that were found to encourage firms to increase these flows were political stability, a sound macroeconomic environment, free movement of capital, availability of skilled labour, a transparent legal environment and a reasonably well developed infrastructure. After identifying the determinants of these flows, the Ad Hoc Working Group concentrated on ways and means of making the environment in developing countries and countries in transition more conducive to transfer and diffusion of technology. It also gave further consideration to policies and measures that help host countries develop their technological capacity, including through the contribution of FDI and imported technology.[15]

30. Particular emphasis was placed on the role of education and technical and vocational training in the process of capacity-building, including the institutional set-up required for human resource development. The work carried out revealed that linkages between these activities on the one hand, and the production sector on the other, remained weak in many countries. This also applies to linkages between R&D and the production sector, which in an innovation-system context acquires particular importance, especially if due account is taken of the role of equipment suppliers, subcontracting, user-producers' interfaces, professional associations and rotation of key professionals.

31. What may help remedy the problems and deficiencies is appropriate management of the process of technology transfer and diffusion. In this respect, different modes of technology transfer were reviewed, including the most commonly used forms, such as capital goods imports, FDI and joint ventures, as well as the less standard though increasingly used forms, such as management contracts, subcontracting and franchising. Work carried out also focused on ways to strengthen the relationship between foreign technology and local technological development. This relationship was likely to be stronger if host countries invested in human resource development and infrastructure while observing intellectual property rights protection. Foreign technology inputs, whether

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[15]See "Final Report of the Ad Hoc Working Group on the Interrelationship between Investment and Technology Transfer to the Trade and Development Board" (TD/B/WG.5/12), 1994.

through FDI or other means, have proved to be a convenient medium for the provision of training opportunities and development of managerial skills. Particular emphasis was placed on the special needs of the least developed countries and the policy approaches that may be required to alleviate the constraints faced by these countries in acquiring foreign technology and building up their technological capabilities. The Ad Hoc Working Group also addressed different policy-related aspects of technological innovation, including the transfer and development of environmentally sound technologies, university-enterprise cooperation, industrial districts and technology partnerships.

32. Finally, the Working Group addressed the determinants of international competitiveness and examined the factors involved, particularly the role of science and technology in influencing the competitive advantage of countries and their enterprises in the rapidly changing international environment. Its work revealed that the upgrading of skills (including organizational and managerial capabilities) production flexibility, and marketing and collaborative arrangements among firms, including networking, are among the influential factors.

III. ISSUES RELATED TO TECHNOLOGY, INVESTMENT AND ENTERPRISE DEVELOPMENT(MIDRAND, 1996)

33. The early 1990s witnessed the restructuring of the institutional set-up of the United Nations in the area of science and technology. In this process, responsibility for the work previously carried out by the Centre for Science and Technology for Development was transferred to UNCTAD, including the servicing of the newly established ECOSOC Commission on Science and Technology for Development. Governments' changing priorities were further reflected in the outcome of UNCTAD IX, particularly as regards the new approach for consideration of technology in relation to investment and enterprise development.

34. The ninth session of UNCTAD (Midrand, South Africa, 27 April - 11 May 1996) adopted a Partnership for Growth and Development, which outlined the orientation of future work and made a significant contribution to reforming the organization. Among the areas singled out for intergovernmental discussions in UNCTAD were the interrelated ones of investment, enterprise development and technology. The strengthening of the capacity of developing countries and countries with economies in transition to improve their overall investment environment was also addressed.

35. Regarding enterprise development, emphasis was placed on facilitating the exchange of experiences in the formulation and implementation of enterprise development strategies, including questions related to privatization and public sector/private sector cooperation as well as ways and means of furthering the participation of developing countries' enterprises in the global economy. The Conference called for science, technology and investment policy reviews to be conducted with interested countries in order to identify options for national action, especially those that foster technological capability and innovation. It also called for an exchange of experiences among countries at different levels of development in the formulation of policies to promote technological capacity-building and innovation in developing countries. This could include diverse forms of inter-firm cooperation, such as networking, clustering and technology partnerships.

36. UNCTAD IX made comprehensive changes to streamline the intergovernmental machinery and refocus the work of the organization. The Trade and Development Board will have the following three Commissions: the Commission on Trade in Goods and Services, and Commodities; the Commission on Investment, Technology and Related Financial Issues; and the Commission on Enterprise, Business Facilitation and Development. The last two are of particular interest here as they deal with technology-related questions. A new division dealing with investment, technology and enterprise development was created to provide substantive support to the work of the two Commissions. It has taken over the work on science and technology for development. It will carry it out in an integrated manner through conceptual work, preparation of issue papers and policy studies, as well as technical cooperation activities, and in cooperation with other international organizations.

PART C: SCIENCE AND TECHNOLOGY IN A GLOBALIZED AND LIBERALIZED ECONOMY ON THE EVE OF THE TWENTY-FIRST CENTURY: SOME POLICY ISSUES FOR CONSIDERATION

37. The Vienna Programme of Action on Science and Technology for Development was adopted in 1979 in an international context characterized by the North-South debate, the remnants of the Cold War and Governments' preoccupation with fostering technological capabilities, but in which there was little participation by the private sector, particularly in developing countries. Emphasis was placed more on highlighting the asymmetries in science and technology between developed and developing countries than on promoting cooperation among enterprises from those two groups of countries. In this environment, foreign direct investment was viewed by many developing countries and Central and Eastern European countries as a mechanism for control over their economies by firms from developed countries, particularly transnational corporations.

38. The international context changed considerably in the early 1990s. The end of the Cold War was followed by increased cooperation between countries of the former Eastern and Western blocs, and privatization, liberalization and globalization began to span all continents. This was subsequently aided by the progress achieved in the Uruguay Round of Multilateral Trade Negotiations, which culminated in the adoption of international agreements governing trade in goods and services, investment and intellectual property rights. In this environment, an increasing number of developing countries realized the merits of strengthening the private sector, and policies were adjusted to nurture the development of enterprises, particularly small and medium-sized enterprises.

39. As a result, developing country economies became more open to foreign direct investment and have adopted measures to stimulate such inflows with a view to promoting the transfer and diffusion of foreign technology, marketing and managerial know-how. Inter-firm cooperation consisting of a variety of collaborative arrangements, including strategic alliances, different forms of partnerships and networking within and across countries, has expanded. This process has been aided by the increased diffusion of information and communication technology, which altered the system of production and work organization, thereby affecting employment and international competitiveness with far-reaching implications for international investment and trade in goods and services.

40. On the eve of the twenty-first century the role and importance of science and technology appear more relevant than ever. However, perceptions and approaches in the consideration of technology-related issues, including the roles, policies and strategies of different actors, have changed. In this context, a number of unresolved old issues as well as new ones have been the focus of international debates and continue to be relevant. Some of these are briefly mentioned below.[16]

1. Technological capacity-building and competitiveness

41. Among the areas that the Vienna Programme of Action emphasized, the process of technological capacity-building remains a priority issue today. While "Vienna" stressed the role of the State, concern now centres on the complex relationship between such capacity-building and competitiveness.

42. Owing to the pressure put on all firms by the recent trends towards globalization and liberalization, systematic attempts have been made by enterprises, particularly from the OECD and newly industrializing countries, to invest in technology and strengthen technological capabilities with a view to improving competitiveness. The costly investment in such new technologies as information technologies is making enterprises from those countries increasingly demand that such an investment generates pay-offs in terms of competitiveness.

43. This has encouraged a growing number of firms, particularly in the OECD countries, to share the development costs and spread the risks in the adoption of new technologies. New partnerships replacing adversarial relations, including cooperative R&D and collaborative arrangements, have become part of the realities of the 1990s. However, many developing countries have been left behind and their participation in this process has been limited.

44. A host of factors, in addition to technology, affect the competitive advantage of enterprises. These include labour costs and skills, financing, trade barriers, exchange rate fluctuations, marketing know-how, production flexibility, and collaborative arrangements among firms. But labour costs, relevant to the majority of developing countries, particularly the least developed countries, have become a less important determinant of competitiveness. Even in traditional labour-intensive sectors, competitiveness is increasingly a function of technological change, continuous training and adaptation of skills, and technological innovation. Consequently, there is a need to improve technological capabilities and draw on R&D for the adaptation of imported technology and its utilization in product development efforts and production activities. This takes on particular importance in the adoption of new technologies, which are

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[16]In this context see also chapter 6, "Agenda for further research", in UNCTAD, "Fostering technological dynamism - Evolution of thought on technological development processes and competitiveness: A review of literature", 1996 (UNCTAD/DST/9, Sales No. E.95.II.D.21); and chapter 5, "Conclusions and areas for future work", in UNCTAD, "Science and technology in the new global environment: Implications for developing countries", 1995 (UNCTAD/DST/8, Sales No. E.95.II.D.14).

increasingly science-based and R&D intensive, with major opportunities and implications for growth and development.

2. Opportunities and challenges of new technologies

45. The increased diffusion of information technologies has given rise to a number of issues affecting the trade and development prospects of all countries, particularly developing countries.[17] This trend is likely to continue and probably accelerate in the twenty-first century, aided by the globalization and liberalization phenomena and the dynamism of the private sector in an increasing number of countries, be they developed or developing. Furthermore, the development and the diffusion of other new technologies such as biotechnology, materials and laser technology have also progressed, although their impact has been felt less than that of information technology. However, on the basis of research and experimental development conducted by enterprises and R&D institutes, there are indications that the diffusion of these technologies will increase in different economic and social sectors.

46. This requires for an assessment of the economic and social impact and implications of those technologies with particular reference to developing countries and countries with economies in transition, including their effects on competitiveness, employment, skill formation and utilization, technological capability-building, inter-firm cooperation and networking. On the basis of such an assessment, policies may be suggested that enable firms from those countries to take advantage of the opportunities that these technologies offer and to respond to the challenges they create at the national and international levels. Thus, there is a need to identify the main issues affecting the growth and development of enterprises in those countries.

3. Issues relating to the interface of technology and enterprise development

47. The changing global environment has created an enhanced role for technology as a crucial factor in enterprise development. Even many small and medium-sized companies, including those in the developing world, cannot escape the need to stay alert to technological change. Innovative strategies, policies and cooperative behaviour of enterprises - so far mainly in the developed countries - have created opportunities and challenges for the enterprise sector. They have also begun to be adopted in the newly industrializing countries and some other developing countries and countries with economies in transition. Governments are thus increasingly perceiving the need to create a policy environment that would enable enterprises of all sizes, particularly small and medium-sized ones, to better understand the innovation process, to take advantage of new opportunities and to contribute more efficiently to the attainment of socio-economic development objectives.

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[17] See "Substantive theme: Information and communication technologies for development. Report of the Working Group on Information and Communication Technologies for Development" (E/CN.16/1997/4).

48. However, despite considerable efforts by Governments to adapt to the changing environment, many developing countries and countries with economies in transition continue to encounter difficulties in building a strong segment of small and medium-sized enterprises. This stems, to a large extent, from their weak capability in such specific services as pre-investment and project execution services, management consulting, engineering design, product development, standards and quality control, and technical extension and marketing, which are particularly helpful to the development and growth of private firms. While an increasing number of developing countries have made progress in producing skilled manpower in terms of scientists and engineers, they still do not have enough organizational and managerial skills, which are particularly critical for the development of enterprises. Another constraining factor is the shortage of finance. Many small and medium-sized firms in developing countries have difficulties in raising the start-up capital from domestic sources, owing to the insufficient development of financial institutions, including the banking system, and weak linkages between this system and manufacturing and service enterprises. The size of these enterprises is an additional constraint on their ability to self-finance their development, including their limited capabilities for tapping international financial markets. Thus, there is a need for efforts at the firm and industry levels to be supported by macroeconomic policies that take into account the needs and motivations of the productive sector.

4. The new role of the State: Some policy considerations

49. The ongoing trend of globalization and liberalization has raised a number of issues pertaining to the role of the State. For some, this role has diminished drastically and market forces have tended to overshadow the effectiveness of national policies. For others, this new trend requires the Government to play a different active role in developing policies that would help developing countries keep up with the changing global market and the new forms of production organization and competitiveness.

50. This raises the question of the role of government interventions, particularly as regards the promotion of technological innovation and the build-up of technological capabilities. The depth and breadth of such interventions are issues for consideration in the design and formulation of policies in the areas of science and technology, investment and trade. At the panel meeting of the CSTD, which took place on 20 and 21 December 1996, some of the experts argued that science and technology should be addressed at a sectoral level and in specific fields, while others tended to favour a more generic approach.[18]

51. One major dilemma which confronts many developing countries and countries with economies in transition is how to ensure the stability of policies aimed at satisfying the long-term objective of scientific and technological development. Strategies need to be explored and adopted to overcome the limitations imposed by macroeconomic instability and budgetary restraints which are threatening R&D, the transfer and adoption of modern technologies and, not least, human resource

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[18]See "Consideration of ways and means of commemorating in 1999 the twentieth anniversary of the Vienna Conference on Science and Technology for Development. Report by the UNCTAD secretariat on the Panel Meeting" (E/CN.16/1997/CRP.2).

development. But before such strategies are elaborated, there must be an assessment of existing science, technology and innovation policies, and of how they interact with development policies, including questions regarding their coordination with investment, industrial and trade policies. The aim of such policy reviews is to evaluate the contribution of science and technology policies to the development of enterprises in developing countries and countries with economies in transition, including their international competitiveness. Their aim is also to integrate science and technology policies with development planning, including the initiation of a more effective dialogue between ministries and agencies dealing with technology, investment, trade and industrialization issues. This will help countries improve their own policies and identify opportunities for international cooperation.[19]

5. Exploring new approaches to technology cooperation, including in the area of environmentally sound technologies

52. While technological capacity has become vital for achieving economic development and sustaining competitiveness, this process is not always instantaneous, costless or automatic, even if the technology is well diffused elsewhere. Apart from physical inputs, it calls for various new skills, technical information and services, contract research facilities, interactions with other firms, equipment suppliers, standards bodies, and so on. The setting up of this dense network of cooperation requires the development of special skills and a favourable economic, institutional and legal environment.[20] The need to keep technologically ahead and to respond to a "globalization of knowledge" obliges companies throughout the world to create new forms of cooperation, relationships and partnerships. Thus, a rapidly growing number of companies, universities and other organizations are contributing to a world-wide pool of commercializable knowledge, and many enterprises are now seeking linkages to other organizations in innovative ways.[21] As part of this trend, new forms of partnership among firms and between firms and organizations in the R&D sector have gradually begun to move into the developing countries. The underlying opportunity afforded by such partnerships is to find new forms of technology cooperation which involve two-way relationships, and determined endeavours to share technological knowledge, and to collaborate on R&D, training, manufacturing and marketing.[22]

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[19]See "Science, technology and innovation policy reviews: Implementation of the Programme on Science, Technology and Innovation Policy Reviews" (E/CN.16/1997/5).

[20]UNCTAD, "Final Report of the Ad Hoc Working Group on the Interrelationship between Investment and Technology Transfer to the Trade and Development Board" (TD/B/WG.5/12), 1994.

[21]J. L. Badaracco, *The Knowledge Link* (Boston: Harvard Business School Press, 1991), p. ix.

[22]See UNCTAD, "Technological capacity-building and technology partnership: Field findings, country experiences and programmes" (UNCTAD/DST/6), 1995; and UNCTAD, "Exchanging experiences of technology partnership" (UNCTAD/DST/15), 1996.

53. In this context, the area of environmentally sound technologies appears to offer substantial possibilities for cooperation. The United Nations Conference on Environment and Development, held in Rio de Janeiro, paid particular attention to cooperation in that area. This is one which was not relevant in Vienna, but which now carries weight because of the demonstration effect it could have on other areas of technology cooperation, given the explicit will of countries at the Rio Conference to work in this area. The application of new, resource-efficient and clean technologies is one of the keys to environmental sustainability. The growing innovative capabilities in this area have created a new spectrum of technology choices in fields such as energy, transportation, agriculture, construction and manufacturing. Effectively promoting the application of environmentally sound technologies often requires incentive measures and policies to create an "enabling environment" such as will lead companies to adopt these technologies and to engage in new forms of technology cooperation.

6. The role of science and technology in integrating the least developed countries into the world economy

54. A major unresolved issue since the "Vienna" Conference remains the integration of the least developed countries (LDCs) into the world economy, including their access to the world's advanced technology. Many of the LDCs have encountered considerable difficulties in strengthening their endogenous scientific and technological capacities: technologies have largely remained external factors, and many universities and R&D institutions barely survived the 1980s. The adverse effect of this situation on the development and modernization process within a region such as Africa is considerable, and endogenous capacities in science and technology with regard to technical training and R&D as well as technology acquisition and adaptation at the enterprise level continue to be rudimentary in most countries of the region. A long-term objective is to improve the policy framework for the utilization of R&D, to create regional information and support mechanisms, and to increase the scientific and technological capacities of the LDCs firms and institutions. Attention may be paid to the needs of small and medium-sized enterprises. Furthermore, access by institutions in LDCs to information networks will be particularly important for avoiding marginalization as regards global technological change.[23]

7. Prospects for South-South technology cooperation: Opportunities and challenges

55. The globalization and liberalization of markets have added a new dimension and created an environment with enhanced potential for South-South cooperation as well as the accelerated development of some developing countries, notably some countries of South-East Asia and Latin America. It may be relevant to consider the opportunities and challenges presented by this new environment for South-South cooperation in the interrelated areas of technology, investment and trade, taking

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[23]See UNCTAD, "Midrand Declaration and a Partnership for Growth and Development", adopted by the United Nations Conference on Trade and Development at its ninth session, 1996 (TD/377).

into account the international agreements resulting from the Uruguay Round of Multilateral Trade Negotiations. The discussion of these and other relevant issues could be a first step towards exploring policies to promote South-South technology cooperation in this new environment.

CONCLUDING REMARKS: REVISITING SCIENCE AND TECHNOLOGY

56. This note has reviewed some of the science and technology-related questions considered by the institutions set up after the Vienna Conference on Science and Technology for Development, as well as some of the policy issues facing the international community on the eve of the twenty-first century. In many parts of the world the problems raised at the Vienna Conference have not disappeared. In the meantime, additional countries that were not its focus in 1979, i.e. those with economies in transition, are now seeking new ways of addressing science and technology-related issues in the present socio-economic setting.

57. The Commission on Science and Technology for Development has contributed to this discussion through its inter-sessional work and the intergovernmental discussions at its first (1993) and second (1995) sessions. In this context it has carried out work in such broad areas as basic needs, gender issues, strengthening of linkages between the national R&D systems and industrial sectors, and information technologies for development.[24]

58. The panel meeting convened by the Commission raised several policy issues for possible consideration, some of which have been addressed in this report. According to the report of the panel meeting, there seemed to be frustration with the limited implementation of the Vienna Programme of Action. In resolution 1995/4, ECOSOC invited the Commission on Science and Technology for Development to give consideration to ways and means of taking advantage of the twentieth anniversary of the Vienna Conference on Science and Technology for Development for the formulation of a common vision regarding the future contribution of science and technology for development. A starting point would be to discuss what has been functional and useful and what has helped to further technological capacity-building efforts in the developing world.[25] Such activities could consider the Vienna Programme and the dynamics surrounding it, for example the lack of political will and of conditions for its implementation. How could a more favourable environment for international cooperation in science and technology be stimulated and mobilized in the future? It is clear that a large section of the population in many parts of the world has not benefited from science and technology, and this may have contributed to social imbalances. Thus any approach for the future consideration of science and technology would have to take into account the concerns of a broad range of actors and stakeholders in development,

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[24]For an account of the Commission's work and its impact, see the report entitled "Implementation and progress made on decisions taken at the second session of the Commission, including follow-up work on technology for basic needs, gender and sustainable development and coalition of resources" (E/CN.16/1997/8).

[25]This activity could be seen as complementary to that of UNESCO in preparing a World Science Conference to be held in 1999. This conference deliberately does not address technology-related issues.

including Governments, enterprises, the scientific and R&D community, and NGOs. The elements of "a common vision for the future" would need to reflect both the varied interests and perceptions of these different development actors and the changes that have occurred in the international economy.

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ACTION ARISING FROM THE SECOND SESSION

Implementation of and progress made on decisions taken at the second session of the Commission, including follow-up work on technology for basic needs, gender and sustainable development, and coalition of resources

Note by the UNCTAD secretariat

The present report has been prepared by the UNCTAD secretariat in accordance with Economic and Social Council decision 1995/237 on the report of the Commission on Science and Technology for Development on its second session and the provisional agenda and documentation for the third session of the Commission.

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INTRODUCTION AND METHODOLOGICAL ASPECTS

1. In line with decision 1995/237 of the Economic and Social Council (ECOSOC), the Commission on Science and Technology for Development is to consider, at its third session under agenda item 4, the question of implementation of, and progress made on, decisions taken at the second session of the Commission, including follow-up work on technology for basic needs, gender and sustainable development, as well as the issue of coalition of resources. Further to this decision, the secretariat has prepared the present note as a background document for this agenda item.

2. Taking into account the universal character of the recommendations of the second session of the Commission, endorsed by ECOSOC resolution 1995/4, the UNCTAD secretariat sought information on the implementation of and progress made on the decisions of the second session for the present note by way of the following: (i) a note sent to the 188 States members of UNCTAD (TDN 870 of 4 September 1996); (ii) a letter sent to the 51 expert members of the Commission, the Coordinator, and eight members of the Advisory Board on Gender Issues on 9 August 1996, together with a brief note/questionnaire detailing the elements contained in resolution 1995/4 and on which information was being sought; and (iii) a letter sent to 25 international organizations and bodies of the United Nations system and specialized agencies and 14 non-governmental organizations (NGOs) dealing with science and technology issues (21 August 1996).

3. The UNCTAD secretariat attached a copy of resolution 1995/4 to all these communications and invited Governments and members of the Commission and of the Advisory Board on Gender Issues and international organizations to provide information on the specific items raised in the resolution, including such issues as technology for basic needs, gender implications of science and technology, technologies for land management, strengthening of research and development systems and support for technological capacity-building projects, access to information technology and coalition of resources for science and technology.

4. Following this request for information, replies were received from 22 countries, 19 of which are members of the Commission on Science and Technology for Development. The responding countries were: Austria, Bolivia, China, Congo, Costa Rica, Egypt, Ethiopia, India, Jamaica, Jordan, Malawi, the Netherlands, Nigeria, Philippines, Saint Lucia (non-member), Saudi Arabia, Senegal (non-member), Spain, Turkey (non-member), the United Kingdom, the United Republic of Tanzania and the United States. Replies were also received from the Coordinator and one member of the Advisory Board on Gender Issues.

5. Fifteen organizations and bodies of the United Nations system and specialized agencies responded to the secretariat's request for information: Department for Policy Coordination and Sustainable Development (DPCSD), Economic Commission for Africa (ECA), Economic Commission for Europe (ECE), Economic Commission for Latin America and the Caribbean (ECLAC), United Nations Centre for Human Settlements (HABITAT), United Nations Environment Programme (UNEP), United Nations Population Fund (UNFPA), United Nations University (UNU), Food and Agriculture Organization (FAO), International Atomic Energy Agency (IAEA), International Civil Aviation Organization (ICAO), International Maritime Organization (IMO), United Nations Industrial Development Organization (UNIDO), World Bank and World Health Organization (WHO). From the NGOs contacted, the World Association for Small and Medium Enterprises (WASME) sent a brief answer indicating that WASME had pursued resolution 1995/4 but, being involved mainly in activities concerning the promotion of small and medium-sized enterprises, it had not

implemented science and technology projects, such as projects aimed at meeting basic needs and addressing land management.

6. From among all the replies received by the secretariat, the information on activities provided by seven countries (Bolivia, Costa Rica (partly), Ethiopia, Jamaica, Netherlands, Turkey and the United Republic of Tanzania) refer directly to the implementation of recommendations of the second session of the Commission. A summary of these replies is contained in chapter I of the present note. That chapter also includes a summary of the information on the activities of the Advisory Board on Gender Issues provided by the Advisory Board, as requested in resolution 2/1 of the Commission at its second session.

7. The replies from other countries, as well as all those received from international organizations, contain information on activities generally relevant to the recommendations of the Commission but do not actually specify whether any of these activities were undertaken as a result of such recommendations. A summary of these replies is presented in chapter II of the note.

8. In addition to the above information, a number of comments were made on the Commission's work in general. The Commission member from Egypt noted that a substantive impact of the Commission could not yet be felt and that no efforts had been exerted to translate the decisions taken by the Commission into activities at the national level. He also stressed the need to make full use of the expertise available among the members of the Commission. The Commission member from Jamaica noted that the ideas and reports emanating from the Commission had and would continue to have a significant impact on the progress of science and technology (S&T) in the underdeveloped countries, although the process was often quite slow. In the case of Jamaica, and in specific instances in the wider Latin American region and the Caribbean, there were clear instances of an important impact. In the response from the Ministry for Development Cooperation of the Netherlands, suggestions were made for further steps to create an exchange of information on the implementation of the Commission's recommendations, particularly between the Commission and its member States, as well as between the Commission and all Member States of the United Nations. The Commission member from Saudi Arabia noted the wide spectrum of activities of the Commission and its efforts to evolve a new working style aimed at making full use of the expertise of its members and suggested for inclusion in the agenda of the forthcoming session such issues as: (a) global environmental problems; (b) control of desertification; and (c) development of regulations and a code of practices (ethics) in laboratory activities. The Government of Saint Lucia expressed interest in an expert mission to that country to assist in developing a national science policy. In the reply from the Agency for International Development of the United States, the Commission's work in the area of information technology was commended. It was also noted that the United States was contributing to the Global Knowledge '97 Conference in Toronto (June 1997), and the hope was expressed that the Commission's work would contribute to that event. Finally, it was felt that the strategy of the Commission should be to assess how the United Nations system was addressing various topics in S&T, rather than focusing on what bilateral donors and member States were doing in those areas.

9. It should be noted that, on such issues as information technology, science, technology and innovation policy reviews, coordination of work in the area of science and technology, consideration of ways and means of commemorating the twentieth anniversary of the Vienna Conference on Science and Technology for Development and scientific and technological aspects of sustainable energy systems referred to in the above resolution, the secretariat is submitting separate reports and notes to the third session of the Commission.

I. INFORMATION ON ACTIVITIES RESPONDING DIRECTLY TO THE RECOMMENDATIONS OF THE COMMISSION

A. Activities at the national level

10. Undertaking measures to support the informal and small and medium-sized productive sectors, including measures to improve their links with the scientific and technological community and apply research and development for satisfying basic needs and promotion of the development of replicable demonstration activities and programmes that apply science and technology for the satisfaction of basic needs. Operative paragraphs 1 and 2 of resolution 1995/4 invite Governments to undertake systematic reviews and other measures to support the informal and small and medium-sized productive sectors and to create an enabling environment that promotes application of science and technology to the satisfaction of basic needs.

11. The National Academy of Sciences of Bolivia conducted, with the support of the International Development Research Centre (Canada), a study to examine the behaviour and linkages of small and medium-sized enterprises (SMEs) in the Bolivian innovation system. This study, the first of its kind in the country, addresses issues related to the actual and potential contribution of SMEs to innovation and competitivity for sustainable development and is to be completed in March 1997. In Ethiopia, with the support of UNDP, the Integrated Human Resource Development and Utilization Programme was developed which recognizes the interdependence and interrelationship of health, education, science and technology and employment. Several activities under the six subprogrammes are being implemented in these areas at the central level. As reported by Jamaica, the report of the Commission's Panel on Technology for Basic Needs served as the basis for two papers on poverty alleviation in Latin America which helped to put the poverty question on the S&T agenda and sought to bring a new dimension to the problem. Following this, UNESCO indicated that it would make the papers into a book for distribution throughout the region. Further to the recommendations of the Commission, in Jamaica the Prime Minister has instructed that those responsible for poverty alleviation projects should be made aware of the Commission's related work, as well as the subsequent papers prepared by the above Panel. The Planning Institute of Jamaica is seeking ways of ensuring that science and technology applications are integrated into the overall poverty eradication strategies of the island. Extension mechanisms are being created to reach the rural poor and urban micro-businesses. It is expected that these efforts could provide useful experiences for other countries as well.

12. Implementation of recommendations made by the Panel on Gender Implications of Science and Technology for Developing Countries, particularly with regard to the Declaration of Intent on Gender, Science and Technology for Sustainable Human Development. Paragraphs 4 and 5 of ECOSOC resolution 1995/4 and its annex refer in particular to the recommendations of the Commission's Panel on Gender Implications of Science and Technology and recommend that all Governments adopt the Declaration of Intent on Gender, Science and Technology for Sustainable Human Development and conduct reviews of the national situation regarding gender and science and technology, and formulate action plans.

13. While no country has reported on the adoption of the above Declaration, at the same time the recommendations of the Commission on gender issues have been translated into specific measures in a number of countries. For example, Bolivia initiated a process which incorporates the recommendations of the Panel in a long-term plan of action which is now being developed and discussed with stakeholders throughout the country. The plan was to be completed in December 1996 and is expected to provide guidelines to the government which will take office in August 1997. The specific

recommendation made by the Commission to individualize the gender element in statistics is already being followed in the data base of science and technology indicators currently being set up. In addition, a project on gender aspects is under implementation with the support of UNIDO. The National Academy of Science of Costa Rica has launched cooperation efforts with other similar centres, universities and research institutions in Central America. Among such activities, a Workshop on Sustainable Development was organized in November 1995 and included a special session on women and sustainable development. The National Academy of Sciences also organized the first Central American course for the training of women scientists in access to Internet services, which was sponsored by UNESCO and a German exchange programme. Ethiopia is continuing implementation of its national policy on women. The report of the Gender Panel of the Commission was used in Jamaica in studies to evaluate the extent of that country's progress in this domain. The Netherlands brought the final version of the report on gender issues to the attention of its highest administrative authorities in the area of science policy and women's affairs, with an invitation to take action in response to the Commission's recommendations. The Netherlands also provided financial support to the setting-up and the work of the Gender Advisory Board. In the United Republic of Tanzania, actions were reported to have been undertaken to ensure an increase in the enrolment of girls in science subjects at both primary and secondary schools. The number of women taking science and engineering programmes at various colleges is improving.

14. Science and technology for integrated land management. Sustainable land management was the sectoral issue discussed by the Commission on Sustainable Development (CSD) in 1995. The contribution by the Commission on Science and Technology for Development to the CSD on that matter included guidelines for the application of technologies that support integrated land management. The Commission called on several agencies of the United Nations system such as FAO, UNEP, Habitat and International Fund for Agricultural Development (IFAD), in cooperation with regional commissions, to design programmes to address specific land management problems and assist developing countries and economies in transition in implementing such programmes (paragraph 6 of resolution 1995/4). Though this recommendation was addressed mainly to international organizations and relevant work was reported by them (see chapter II), certain activities were reported at the national level. In Jamaica a major conference was organized by one of the country's main tertiary institutions on the basis of the report of the Panel on Land Management.

15. Strengthening research and development systems for building innovative capacities and support to technological capacity-building projects. The relevant Commission recommendations contained in resolution 1995/4 invite the international community, through diverse aid programmes, to enhance the linkages with enterprises, universities, foundations, research institutes, scientific laboratories, trade and professional associations, and other mechanisms for international scientific and technological cooperation and to strengthen its support for countries in improving their R&D innovation systems (paragraph 7), and also call on the international community and the United Nations system to support projects fostering technological capacity-building as a major factor for effective technology transfer and long-term growth in interested countries, including least developed countries (paragraph 10).

16. In January 1996, the National Council for Science and Technology of Bolivia adopted a "Short-Term Plan of Action" covering the period from January 1996 to August 1997 which contains projects on the improvement of the technology/productive-sector interface; the generation of strategies for the productive transformation of rural areas; the strengthening of scientific research and human resources development capacities and the strengthening of the national institutional framework for science and technology. Within the plan's framework, a relatively small number of projects were chosen, for example, to demonstrate to political and economic decision-makers that

effective results can be obtained on the basis of prioritized projects. A special project was implemented with the assistance of international organizations to improve linkages between universities and enterprises as a mechanism to further build up innovative capacities. The National Council for Science and Technology started setting up "business meetings" among universities and enterprises concentrating on specific sectors, namely food, metal mechanics, and pharmaceuticals, and helped the larger public universities to set up linkage mechanisms as part of their research infrastructure. In October 1996, a large workshop was to bring together representatives from universities, enterprises and government to finalize specific agreements for an action-oriented plan aimed at developing such functional linkages. Ethiopia, through its Science and Technology Commission, is guiding, coordinating and supporting S&T activities, including R&D, by strengthening the infrastructure required for technology development and creating incentive mechanisms to encourage enterprise research. These mechanisms include the Local Research Grant Scheme and the International Cooperation Scheme. It was reported that, to date, a significant research capacity has been created in many fields. In the United Republic of Tanzania, the activity of the National R&D institutions and the acts which established them are being reviewed to avoid duplication of efforts and ensure that research addresses the needs of people and allows the private sector to participate fully in the development and application of S&T.

17. Access to information technology networks by scientific and technical institutions in developing countries and countries with economies in transition and the facilitation of appropriate electronic communication among institutions engaged in science and technology for development. Resolution 1995/4 contains, in paragraph 8, the Commission's recommendation that Governments and intergovernmental and non-governmental organizations give priority to effective access to networks, such as the Internet, by scientific and technical institutions in developing countries, in particular the least developed countries, and countries with economies in transition, through the provision of technical and other support for related investments, and facilitate appropriate electronic communications among institutions engaged in science and technology for development.

18. Bolivia was reported to be initiating new policy guidelines to develop information systems in the country, including measures for the creation of information networks, the informatization of libraries and support for scientific journals, and provisions for training and the diffusion of information on available services. Until 1995 there had been no government support for information systems, and Bolivia had no access to Internet, which was only made possible in 1996 through the intervention of the National Council. Some networks have already started operating under draft policy elements, among them the Sustainable Development Network which provides environmental information and an international programme for the information of enterprises. The new policy is also to promote the creation of private sector firms dedicated to the development of information technologies and linking the existing ones with the larger telecommunication companies. In Ethiopia, the National Computer and Information Centre encourages and supports the building-up of national capabilities in the area of information systems and networks. To this end, the Centre has enabled a few R&D and academic institutions and some government organizations to have access to electronic communication with the use of facilities of the Economic Commission for Africa. By the end of 1996, the access capacity of users was to be upgraded to have on-line access to Internet, and Ethopia should have become the twenty-fourth African country to be fully connected to the information superhighway. This process was assisted through projects supported by UNDP and UNESCO. Ethiopia also reported an inadequacy of skilled manpower in the field of information technology, training of users, proper facilities and equipement. In the seventh five-year development plan of Turkey, the establishment of a national information network including research organizations and universities and

the creation of the necessary infrastructure to open this network to international access have been identified as priority objectives. In addition, the provision of information on research activities and the creation of a legal framework for commercial activities under the network system have also been foreseen. In the United Republic of Tanzania, a National S&T Data Base has been created which caters for researchers, planners, academicians, entrepreneurs, etc.. Studies are carried out on dynamic systems of improving communication among institutions and also between Tanzanian institutions and the outside world. Efforts to implement straightforward systems, as well as the promotion of the Electronic Mail System, have been pursued through the COSTECH - a growing E-mail node in Dar es Salaam which specifically caters for S&T. In trying to assess and oversee the development of E-mail and Internet in the Republic of Tanzania, a round table discussion on the development of the electronic network and Internet was held in July 1996.

B. Activities of the Advisory Board on Gender Issues

19. The Advisory Board on Gender Issues was established by resolution 2/1 of the Commission on Science and Technology for Development for a period of four years and on the basis of extrabudgetary resources. The Board[1] was to serve as an expert group to facilitate future deliberations of the Commission and the follow-up to its recommendations on the gender implications of science and technology for developing countries. In accordance with resolution 2/1, the Board should report to the Commission at its third and fourth sessions. The information received by the UNCTAD secretariat from the Coordinator of the Board is presented below in summarized form.

20. Early in 1996, an interim Board Secretariat was established at the Faculty of Environmental Studies at York University in Toronto. Between 31 January 1996 and 15 September 1996, the inception activities of the York Secretariat were funded by a grant from the International Development Research Centre (IDRC). This "inception grant" was established using residual funding from a grant originally allocated to the IDRC for the work of the Gender Panel by the Netherlands Ministry of Foreign Affairs. A new grant proposal and detailed budget to cover the work of the Gender Advisory Board from 1 September 1996 to 31 December 1998 has been approved by the Netherlands. The new grant will cover the costs of the York University Secretariat and three Regional Secretariats for varying periods between 1 September 1996 and 31 December 1998. Future Board activities will include the setting-up of three interactive Regional Board secretariats in South-East Asia, Latin America and Africa. Initial plans have been outlined for the establishment of a first Regional Secretariat in Jakarta as a joint initiative of the Indonesian Institute for Science (LIPI) and the Gender Focal Point at the UNESCO Regional Office. Preliminary plans for the establishment of a Regional Secretariat for the four MERCOSUR countries were formulated at two meetings held in Montevideo in June 1996 and October 1996. Intensive work, including missions in relation to an African secretariat, will begin in 1997.

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[1]The Bureau of the Commission recommended eight persons to serve as Members of the Board during the intersessional period from May 1995 to May 1997: Dr. Swasti Mitter (Netherlands/India), Dr. Marina Ranga (Romania), Professor Farkhonda Hassan (Egypt), the Hon. Winnie Byanyima, M.P. (Uganda), Dr. Shirley Malcom (United States), Dr. Joske Bunders (Netherlands), Dr. Geoffrey Oldham (United Kingdom), and Dr. Sonia Correa (Brazil). There are presently seven active Board members, and an eighth member is being sought to replace Dr. Correa. Dr. Bonnie Kettel was appointed by the Board as interim Board Coordinator at a Board planning meeting in November 1995. Her term of appointment will expire with the appointment of three Regional Co-ordinators. Dr. Betsy McGregor, former Director of Studies for the Commission's Gender Panel, has also continued to actively support the work of the Gender Advisory Board.

21. There were contributions by various members of the Gender Advisory Board to several preparatory meetings of the Beijing Conference on Women (1995) and related caucus activities. Specific recommendations in the Draft Platform of Action were drawn from the Gender Panel report of the Commission on Science and Technology for Development, and additionally, science and technology were included specifically in paragraph 35 of the Beijing Declaration. Several members of the Gender Advisory Board also participated in various preparatory meetings for the NGO Forum in Beijing and in the Beijing Conference itself, in particular through official presentations, participation in national delegations of a governmental and non-governmental nature, and in various workshops.

22. In the period after the Beijing Conference, members of the Gender Advisory Board, as well as of the Panel on Gender Issues, in particular its Chairman and the Director of Studies, were involved in various activities aimed at the implementation of the recommendations of the Commission, including the establishment of regional and national centres for the promotion of women in S&T. Following the Commission's recommendations, the Secretariat of the Board prepared a communication circulated through the UNCTAD secretariat to all Governments containing information on the gender-related recommendations of ECOSOC resolution 1995/4 and of the Commission itself, including on the establishment of national ad hoc committees for gender, science and technology, and on the support which could be provided by the Board. The Governments of Ethiopia and Honduras have initiated action in response to this communication. Members of the Board and of the Panel on Gender Issues participated in discussions about the formation of national ad hoc committees, particularly in member countries of ASEAN and MERCOSUR, as well as in several African countries, such as Egypt and Uganda. Promotional and information dissemination activities were also undertaken in the United States of America and Canada. Members of the Board have established and maintained contacts with various governmental and non-governmental international and national orgnaizations, in particular UNESCO and United Nations Development Fund for Women (UNIFEM).

II. INFORMATION ON ACTIVITIES GENERALLY RELEVANT TO THE PROVISIONS OF ECOSOC RESOLUTION 1995/4

A. Activities at the National level

23. Undertaking measures to support the informal and small and medium-sized productive sectors, including measures to improve their links with the scientific and technological community and apply research and development for satisfying basic needs and promotion of the development of replicable demonstration activities and programmes that apply science and technology for the satisfaction of basic needs. Three developed countries reported having undertaken efforts to promote technologies for basic needs in developing countries. The Austrian Development Cooperation Programme supported several projects to enhance local production in relevant sectors and thus to improve the satisfaction of basic needs. In the United Kingdom, a comprehensive set of measures has been undertaken to support programmes and projects which assist capacity-building through transfer of technical know-how and promote the small-scale enterprise sector, in particular through the activities of the Overseas Development Administration (ODA). ODA places particular emphasis on assisting developing countries to promote economic reform, identifying more effective policies for the participation of the poor in the development process, and integrating these policies into a country's adjustment programmes. ODA supports adjustment activities which aim to protect the poor and vulnerable, such as reform of the public sector (in particular efforts to improve the allocation and use of public expenditure); sector-focused assistance to promote better provision of key social services, such as education and health; and research into the impact of reforms to assist recipients and donors in designing and implementing

reforms. The efforts of the United States Agency for International Development (USAID) have been conducted largely via programmes supported by the Center for Economic Growth (which emphasizes globally oriented programmes) and through individual country portfolios, particularly in agricultural areas, where small producers have been linked to state-of-the-art expertise in the United States. This expertise has been provided by direct linkages to United States universities for research, for example on commodity crops and livestock, and in some cases to United States corporate research organizations. An example of the latter was a project focused on biotechnology linking two small tissue culture companies (one in Indonesia and one in Costa Rica) to a United States R&D firm which employs innovative technology to lower unit costs of production. Support includes research for new varieties of crops, livestock vaccines, aquaculture technologies and integrated pest management practices and research on soils, and is implemented through USAID's support for International Agricultural Research Centers, the Collaborative Research Support Programs (CRSPs) with United States land-grant institutions, and private sector contractors. USAID also supported premier United States research organizations such as the National Institutes of Health in the development of vaccines and other interventions for the control, treatment and eradication of diseases which are often endemic in developing countries. It has provided support to the CRSPs, which are globally oriented programmes designed to apply the same types of research methodologies to address issues of crop productivity in various agro-ecological settings. CRSP research is targeted at a number of crops and agricultural areas which are highly important to basic food security and the productive agriculture sectors of developing countries. Technology-based CRSP programmes include the ones on sorghum/millet, pond dynamics, soils, small ruminants, bean-cowpea, peanut, integrated pest management, and sustainable agriculture and natural resource management.

24. As for developing countries, the Chinese Government has taken special measures to stimulate the private sector to improve its R&D capacity, especially at the level of township and village enterprises and non-governmental S&T enterprises. In India, various elaborate programmes on the development of small and medium-scale industries, the advancement of women and the improvement of land and water management have been under implementation. In Jordan, the Higher Council for Science and Technology has recently established the Industrial Research Fund, the main objective of which is to provide financial assistance for SMEs to solve technical problems and improve the quality of products and production processes. The National Council for Science and Technology of Malawi is going to pay special attention to the poor, disadvantaged groups, women and children. The Philippines, under the aegis of the Asia-Pacific Economic Cooperation (APEC) Forum, has established the Centre for Technology Exchange and Training for Small and Medium Enterprises which is to support the sustainable development and growth of SMEs in the region through technology exchange and cooperation aimed at increased productivity and competitiveness. It will function as a resource centre with capabilities in information networking, technical training and the organization of special technology transfer projects. The Centre will also respond to specific requests for technology information and training by drawing on the competence and specialization of member economies in specific fields of technology. Senegal has continued efforts aimed at wider use of solar energy and biogas technologies for satisfying basic needs.

25. Implementation of recommendations made by the Panel on Gender Implications of Science and Technology for Developing Countries, particularly with regard to the Declaration of Intent on Gender, Science and Technology for Sustainable Human Development. Graduate scholarship programmes in Austria emphasize the role of well-educated women in developing countries. In Costa Rica a general programme for the promotion of women was set up at the presidential level. Additionally, the Office for Women and the National Programme for Women and the Family, as well as diverse

committees at the level of universities and most public institutions, are dealing with different gender-related matters. Jordan is reported to be currently engaged with the Economic and Social Commission for Western Asia (ESCWA) in a study which will concentrate on the role of women in research and development. Acknowledging that education is an individual right and as a response to different appeals in this respect, including from the Commission, the Government of Malawi introduced in recent years free primary (basic) education. Consequently, many of the girls who could not afford to attend school in the fee-paying system are now doing so.

26. One of the mandates of the Ministry of Women's Affairs and Social Development established by the Government of Nigeria in 1995 was to provide incentives for women to train in technology-related fields through scholarship and fellowships. The Ministry also organized public awareness programmes to sensitize parents against male preference in the education of children. The Declaration of Intent on Gender, Science and Technology for Sustainable Human Development has been forwarded to the Ministry. In addition, UNESCO has been funding a participative programme in connection with the National Survey on the Science and Technology Potential of Nigerian Women. Senegal has been pursuing a policy of giving priority to women in providing fellowships in the area of S&T. The Government of the United Kingdom has been working actively to achieve goals set out in the Declaration of Intent on Gender, Science and Technology with a view to promoting the role of women in science, engineering and technology in that country. In 1994, a Development Unit on Women in Science, Engineering and Technology was established within the Office of Science and Technology, which acts as a facilitative body, stimulating and coordinating the action of existing expert bodies at the national level. The Office also prepares various materials aimed at promoting women in science, engineering and technology, and organizes events to increase public awareness of the contribution of women to S&T. With regard to activities in developing countries, the Overseas Development Administration aims at helping people to achieve better health and education and to widen opportunities, particularly for women. In the United States, USAID has established an office of Women in Development (WID) to ensure that the Agency's programmatic interventions, whether in research or operational areas, sufficiently addresses the issue of gender equity. The WID office provides guidance at the level of programme design and implementation. Additionally, many of USAID's programmes devote significant resources to addressing development matters which affect the basic needs of women. For example, approximately 41 per cent (or approximately 500) of CRSP degree trainees were women. Sensitivity towards gender is now a formalized element of USAID's S&T approach for development. As reported by the Philippines, within the framework of APEC, top priority has been given to the integration of gender as a cross-cutting concern for achieving the APEC goal of ensuring equitable development. At a meeting held in Manila in October 1996, Women Senior Leaders from APEC Economies launched the Women Senior Leaders' Network. The Network aims at incorporating a gender perspective in APEC and through it increasing prospects for equitable economic growth, reducing poverty and promoting sustainable development in the region. The recruitment and retention of highly talented women in the science and technology field was considered at the Second APEC Ministers' Conference on Regional Science and Technology Cooperation, held in Seoul in November 1996. The Ministers identified the need to remove barriers and the promotion of the full contribution of women to S&T innovation and creativity as an essential element in meeting the goal of sustainable and equitable development.

27. Science and technology for integrated land management. In Jordan, financing was approved for the period 1996-2000 for activities in areas directly related to land management, such as processing, upgrading and bonification of mineral raw materials, the utilization of unexploited surface water resources, remote-sensing techniques, biological diversity matters, the evaluation of earthquakes hazards and methods of mitigating their environmental impact, and the establishment of environment databases.

The United States reported that, while the Agency for International Development has not developed a specific set of guidelines or policies which relate directly to the application of technologies supporting integrated land management, it has promoted Collaborative Research Support Programmes (CRSPs) in such areas as sustainable agriculture or on such matters as Broadening Access and Strengthening Input Market Systems (BASIS), as well as a number of initiatives in its Environment Center, regional bureaux and individual missions.

28. Strengthening research and development systems for building innovative capacities and support for technological capacity-building projects. Recent development cooperation activities in developing countries supported by Austria include special education sector programmes, including the establishment of education and research centres and the training of developing countries' staff at the vocational and university level in Austria, partly in cooperation with industrial companies. In its five-year plans, the Chinese Government sets out guiding principles for S&T development and a comprehensive range of related activities. China's main guiding principle for the current and long-term development of S&T (up to the year 2010) is to implement development strategies whcih effectively rely on science and education and aim at achieving sustainable development. S&T measures identified for implementing such strategies include: (i) optimizing the management structure of scientific research; (ii) developing S&T personnel and securing their rational distribution across the country; (iii) promoting research and development and the application of technologies; (iv) concentrating on the development of key technologies affecting economic and social development; (v) encouraging the establishment of R&D centres in large enterprises; (vi) developing new and high-tech industries; (vii) effectively combining R&D with technology importation and assimilation; (viii) enhancing the linkage of R&D institutes, universities and industries; (ix) accelerating the commercialization and industrialization of S&T achievements; (x) protecting intellectual property rights; and (xi) controlling industrial pollution. A number of specialized programmes aim at strengthening the R&D system. Among them, the Hi-tech R&D Programme is to narrow the gap between Chinese and foreign technologies, train a new generation of high-level S&T personnel, promote the commercialization and industrialization of S&T results, particularly for the reconstruction of traditional industries, and play a leading role in creating opportunities for advantageous high-tech industries in the twenty-first century. The programme concentrates on biotechnology, space technology, information technology, laser technology, automation technology, energy technology and new materials. China's Torch Programme is a guideline programme for developing new and high-tech industries aimed at implementing the general policy of reform and opening to the outside world. Under this programme, 52 state-level new and high-tech industrial development zones have been established. The Government of China also pays special attention to the training of S&T researchers and has set up over 40 Productivity Promotion Centres across the country providing training services. In September 1995, the Government of Congo adopted a law providing orientation and programming for the country's science and technology development. The application of this law is designed to facilitate the establisment of institutional mechanisms for improving the performance of the science and technology systems of the country. The new national science and technology (S&T) policy gives priority to such sectors as agriculture, health, the exact and natural sciences, the social sciences and industry and technology. In Jordan, a major project on S&T has been implemented to enhance the capacities of Jordanian institutions in R&D in such fields as physics and medicinal plants. In Nigeria, the Minister of Science and Technology recently established institutional machinery to review the S&T Policy adopted in 1986. The Carnegie Corporation from the United States has been funding a project on the strategic management of S&T policy in the Business and Technology Development Department of the Nigerian Institute of Social and Economic Research (NISER). In a statement issued on 15 September 1995 by the United Nations Office for Outer Space Affairs, Nigeria was

chosen to host the Centre for Space Science and Technology Education for the benefit of Africa's anglophone countries. With a view to improving and monitoring the development of its S&T sector, the Government of Saint Lucia has taken the initiative of establishing a National Council for Science and Technology for Development. The Council is to oversee the implementation of the Government's own priorities in this area, as well as of the recommendations of the Commission on Science and Technology for Development and of other regional and international organizations promoting the application of S&T to sustainable human development. The National Council will also provide assistance in setting priorities for R&D and ensuring application of R&D results in the productive sector. As reported by the Philippines, the second Ministers' Conference on Science and Technology of APEC, held in Seoul, Republic of Korea, in 1996, reaffirmed the importance of S&T for continuing economic growth and for the sustainable and equitable development of the region. Increased interaction between private and public sector S&T was considered to be an important stimulant for enhanced trade and investment liberalization and facilitation. The ministers agreed that policies for science, technology and innovation should be directed towards improving access to existing knowledge, creating new knowledge and new industries, and promoting the participation of youth in S&T activities. Full creativity and mobility of the scientific and technical human resources of the region would be achieved when Governments, universities, institutes and businesses join forces across economic and cultural boundaries. The activities related to R&D in Senegal have been directed mainly at promoting applied research in agro-based industries, responding to the demands of the enterprise sector at the industrial and artisanal levels. Senegal has developed a number of specific techniques in the domain of the processing of fruit and vegetables, their conservation, along with that of fish and meat, and more generally, post-harvest technologies. Accordingly, its training programmes have emphasized the mastering of food-processing and conservation technologies, giving attention to the upgrading of skills required by different economic agents in agro-food processing. Senegal has additionally made its expertise in this domain available to other countries in the subregion. Spain reported on the continued application in that country of the Law of Promotion and General Coordination of Scientific Activities (1986) and described measures to support productive sectors, including measures to improve their links with S&T. In the United States, the strengthening of R&D systems for building innovative capacities has been a cornerstone of USAID's approach in the application of science and technology to development problems. The Agency has emphasized training and both human and institutional capacity-building in all facets of its portfolio, including the development of national agricultural research institutions, national and community-based health organizations and regional research networks, and the organization of trade and professional associations among various sectors (i.e. agribusiness, science academies, commodity associations). Recently, it has begun to examine the mechanisms by which research organizations can be more responsive to potential end-users to ensure sustainability of financing and effort, particularly in Africa. Support for the Collaborative Research Support Programs (CRSPs) in this area has resulted in the training of approximately 400 PhD students, 600 MS students and 250 BS students from developing countries. In Egypt, it has supported the establishment of five state-of-the-art laboratories in biotechnology. The USAID Program in Science and Technology Cooperation, an investigator-initiated competitive grants programme, has provided resources totalling US$86 million in the award of approximately 650 grants.

29. Access to information technology networks by scientific and technical institutions in developing countries and countries with economies in transition and the facilitation of appropriate electronic communication among institutions engaged in science and technology for development. As reported by China, its State Science and Technology Commission (SSTC) is in charge of the identification, registration and classification of S&T results all over the country and of identifying the important ones for their dissemination. Since 1990, the SSTC has implemented the National S&T

Achievements Spreading Programme. Key research institutes, universities and national laboratories all have their publications regularly disseminated to the public. India, in its communication, referred to a report on the National Information Infrastructure and Profile of India, prepared within the framework of its participation in the Commission's Working Group on Information Technology. The report indicates that the country has a diversified computer industry with extensive R&D, including the software sector. Many achievements have been recorded in India's telecommunication sector and in access to Internet. In Jordan, the National Information Centre is active in the area of disseminating S&T information. Many scientific centres and universities in the country are already connected to Internet. The Government of Malawi has, with assistance from UNDP, embarked on a Sustainable Development Network Programme (SDNP). Its main objective is to help Malawi develop the capacity to acquire information, know-how and technology to implement appropriate solutions for sustainable development and to share this with stakeholders such as scientists, researchers and technologists throughout the country. The Programme will enhance the capacity of stakeholders to use computer-mediated communications, including the Internet. It will do so through training and the provision of equipment to encourage users in linking to electronic network systems. The Programme will also help develop a full on-line Internet connection and establish a widely accessible information server on sustainable development. Nigeria is actively participating in a project called COPINE (Cooperative Information Network Linking Scientists, Educators, Professionals and Decision-Makers in Africa), with the objective of solving the problem of the isolation of the African continent. The project, launched by the UN Office for Outer Space Affairs (OOSA), aims at improving the collection, transmission, distribution and exchange of information. Twelve African countries, including Nigeria, and five European centres are participating in the COPINE project. The networking activities in Nigeria are represented by a large academic network and the Nigerian Internet Group Network. In March 1994, the Philippines, through its Department of Science and Technology, and in line with its efforts to enhance R&D and commercial services through access to information technology, established the Philippines Network of Computers (Phnet) which is the country's link to Internet. This paved the way for the establishment of more than 40 Internet Service Providers in the country. At present, 10 access node connections are in place in a number of academic and research institutions. The country's leased line was upgraded in October 1995, and regional hubs have been set up and are now operational. The Overseas Development Administration of the United Kingdom has assisted a number of developing countries and countries in transition, including Jordan and the Russian Federation, in strengthening their telecommunications sector, and it has also participated in funding a World Bank affiliate on "Information for Development" which channels policy advice in the telecommunications sector to developing countries and prepares pilot informatics projects. In the United States, in the area of telecommunications, USAID has initiated a major programme known as the Leland Initiative, designed to address the growing gap in communications technology among developing nations by providing state-of-the-art hardware, software and training in computer and electronic communications technology. A portion of the support to be provided by this initiative will be geared to enhancing capacity in the field of telecommunications among scientific institutions, as well as others.

30. Coalition of resources for science and technology for development. The United States reported that USAID has undertaken a number of initiatives with other donors to coordinate activities and examine complementarity of efforts in the science and technology development agendas. A Common Agenda with Japan has been established, which will make it possible to explore S&T collaboration in a variety of areas, including food security. A similar effort has also been undertaken with the European Union.

B. Activities by international organizations

31. Communications received by the UNCTAD secretariat from organizations and bodies of the United Nations system and from specialized agencies indicate that over the recent period many of them have carried out over the recent period activities relevant to recommendations of the second session of the Commission on Science and Technology for Development. The main thrust of these organizations' work in the area of science and technology is particularly relevant to the matters reflected in operative paragraphs 7 and 10 of ECOSOC resolution 1995/4, which invited the international community to strengthen its support for countries in improving their R&D innovation systems and support projects fostering technological capacity-building. Below is a summary of communications received by the UNCTAD secretariat from international organizations.

32. Undertaking measures to support the informal and small and medium-sized productive sectors, including measures to improve their links with the scientific and technological community and apply research and development for satisfying basic needs. The Economic Commission for Africa (ECA) reported having given more priority to science and technnology for meeting the requirements of food security and sustainable development. From January 1997, science and technology issues are to be dealt with in the new "Food Security and Sustainable Development" Division. The Economic Commission for Latin America and the Caribbean (ECLAC) has been active in the analysis and dissemination of information through publications and seminars involving farmers' associations, private agro-industries, academic institutions and government officials on successful experiences in agricultural technology transfer to small and medium-scale farmers for their integration into agro-industry. During 1995 and 1996, Colombia, Ecuador, El Salvador, Guyana, Jamaica, Mexico, Peru, Saint Lucia, and Trinidad and Tobago participated in this activity. Direct assistance has been provided to the Board of Technological Development in the Southern Cone in defining future technological requirements for agricultural growth in the region and in identifying areas for inter-country research collaboration.

33. The United Nations Centre for Human Settlements (HABITAT) has been actively involved in strengthening its member countries' capacity to use technologies which facilitate a more effective response to people's basic needs, while clearly ensuring the full involvement of both men and women, within a sustainable development framework. This has in particular been done through the Settlement Management Training Programme, which emphasises the development and dissemination of innovative training materials for more effective, efficient, transparent and accountable management of development of urban and rural areas. Other relevant Habitat programmes include the Local Leadership Training Programme; the Programme of Support to Capacity-building; and Localizing Agenda 21: Action Planning for Sustainable Urban Development, which responds to Chaper 28 of Agenda 21. The United Nations Population Fund (UNFPA), following the International Conference on Population and Development (ICPD), reoriented its programme focus and operational strategies towards three main areas: reproductive health, including family planning and sexual health; population and development strategies; and advocacy. Over the years, UNFPA has undertaken and supported various activities and initiatives in the area of contraceptive technology, research and development, and information dissemination. The Fund has provided extension support to the Programme for Appropriate Technology in Health and has also supported and cosponsored the WHO Special Programme of Research, Development and Research Training in Human Reproduction. UNFPA also served as chair of the ACC Task Force on Basic Social Services for All.

34. The United Nations University (UNU), through its Programme for Biotechnology in Latin America and the Caribbean, has undertaken capacity-building efforts in this domain with a focus on vaccines for human and animal diseases and diagnostics, plant

genetic engineering with special reference to resistance against diseases and pests and improvement of nutritional quality, and microbial fermentations of industrial interest. In cooperation with FAO, UNU continued to support the International Network of Food Data Systems (INFOODS), which was established in 1983 to provide leadership in the development of standards and guidelines for generating, compiling and reporting food composition data. INFOODS is managed and operated by regional liaison groups. UNU participated in a concerted effort of several UN and non-UN agencies to eliminate, as public health problems, micronutrient deficiencies in respect of iron, vitamin A and iodine by the end of the decade. WHO, UNICEF, the World Bank, IDRC and USAID were other major actors in this initiative and provided financial support. Building on earlier efforts in food fermentation, UNU aimed at enhancing scientific understanding of traditional fermentation technologies for their improvement and optimization. Training courses on nutrition and food technology have been provided at the National Food Research Institute in Tsukuba, Japan, and at other UN-associated institutions.

35. Many aspects of the work of the World Health Organization (WHO) relate directly to using science and technology achievements for the satisfaction of basic needs, particularly in respect of health care. In dealing with problems of health care technology management, WHO has emphasised policy issues and support for countries in matters relating to policy analysis and development. A health care equipment management training programme has been developed and is being implemented in all WHO regions. Information support, promotion of awareness and advocacy are also being facilitated by publications and dissemination of selected materials. Important areas for information exchange, sharing of knowledge and international collaboration promoted by WHO include medical devices, regulatory affairs and health technology assessment methodologies. Systematic efforts have been made to provide guidance on essential equipment for health facilities, particularly at the primary and district levels, as well as the design of specific equipment for world-wide use. WHO is committed to supporting its member States in the strengthening of national capacities for the efficient, safe and cost-effective use of health technology as an integral component of overall health systems development. WHO has been working on a document entitled "Development of a Research Agenda for Science and Technology to Support the Health for All Strategy", which is to be presented to the WHO Executive Board in January 1998. Future research efforts should be focused on, among other things, the control of diseases associated with poverty using well-known effective measures and applying existing knowledge; control of both infectious and non-communicable diseases which are specific to the tropics, using all available resources, including basic, clinical and epidemiological research; treatment and care of the sick based on biomedical research, science and technology; delivery of health services (by working with policy-makers and communities) through the process of assessing needs, planning, financing and implementing programmes. The efforts of the WHO Advisory Committee on Health Research (ACHR) have aimed at a structured contribution to the renewal of the Health for All Stragegy. The Global Health Research Agenda is expected to address both substantive and methodological issues. It will deal not only with the global burden of disease but also with the interaction between health and other relevant sectors. Various methods for measuring health using statistical indicators, as well as new computer-based visualisation techniques and knowledge-based systems using structured qualitative information derived from expert advice, will be examined.

36. The activities of the World Bank have included assistance for approximately 75 agricultural research projects supporting programmes on and the development of agricultural and farming techniques geared to upgrading natural resource management. The Bank's loans and credits for these projects have ranged between $21 and $150 million; by way of an example, the credit for the Agricultural Technology Project for Mexico (1992-1999) was $150 million. Numerous national agricultural research projects

in several African countries have been designed and supported by the Bank to enhance the effectiveness of agricultural research.

37. Implementation of recommendations made by the Panel on Gender Implications of Science and Technology for Developing Countries. Several organizations of the United Nations system and specialized agencies reported on activities related to this issue. Thus, ECLAC, together with UNIDO, has issued a report on the participation of women in manufacturing, its patterns, determinants and future trends, particularly at the regional level. A regional seminar was organized by ECLAC and UNIDO to discuss women's participation in the manufacturing sector. Project activities aimed at the involvement of women in maufacturing have been implemented in Bolivia and Colombia. HABITAT was reported to have incorporated gender into all of the work of the Centre. Through its Women in Human Settlements Development Programme, it has organized several gender awareness training workshops. The Programme on Indicators Processes involved training of women to carry out base-line surveys to determine the extent and quality of women's participation within their human settlements. In the field of networking, the Programme supported the Women and Shelter Network and participated in various inter-agency activities. The Programme has been implemented in seven African countries, seven countries in Asia and six Caribbean countries. UNU/INTECH, jointly with UNIFEM, has carried out research on the impact of new technologies on women's industrial work in Asia and examined the impact of new technologies on employment and entrepreneurial opportunities for women in nine countries selected to reflect the economic and market diversity of the Asia-Pacific region. In the conduct of research, regional workshops involving NGOs and government bodies were held in Bangladesh, China, India, Indonesia, Malaysia, the Republic of Korea, and Sri Lanka to collect and exchange information and opinions on the issue. As a result of the research, a book entitled "Women Encounter Technology" by S. Mitter was presented at the Fourth World Conference on Women held in Beijing, China, in September 1995. The research project was extended to 1996-1997 to further explore the impact of information-intensive modes of production on the quality and quantity of women's employment in the Asia-Pacific region, with special attention to the manufacturing and service sectors.

38. Science and technology for integrated land management. In the work of the Economic Commission for Africa (ECA), science and technology for integrated land management is tackled through activities in remote sensing, cartography and the geographic information system (GIS). In this respect, ECA organized the Ninth United Nations Regional Cartographic Conference for Africa, from 11 to 15 November 1996, in Addis Ababa. Policies and orientations promoted by ECA in the field of research and development have placed emphasis on the adaptation, application and absorption of of-the-shelf international technology, as some developing countries of Asia have done. The Economic Commission for Europe (ECE) has been undertaking an initiative to strengthen land administration capabilities, mainly for countries in Eastern and Central Europe, to identify current needs and problems related to land administration in these countries and to enable experts both from countries in transition and from the developed market-economy countries to share views and experiences. Several seminars and workshops on the subject have been organized so far. In 1996, ECE published "Land Administration Guidelines" with the main objective of assisting countries in transition to introduce a new land administration system through the application of a step-by-step approach. The publication addresses such issues as legal frameworks, financial matters, land-use planning, institutional arrangements, procedures for introducing a land management system, etc. The United Nations Environment Programme (UNEP) reported that, when in 1994 the Food and Agriculture Organization (FAO) was appointed Task Manager for Chapter 10 of Agenda 21, UNEP provided funds and technical inputs for a joint project to prepare guidelines for the formulation of policy frameworks for integrated planning and management of land resources, which were developed after extensive consultation with relevant international institutions. Subsequently, the

draft guidelines were reviewed by an expert group. The document is expected to provide enhanced knowledge on reviewing and developing policies that support the best possible use of land and the sustainable management of land resources, as well as improved and strengthened knowledge of planning management and evaluation capabilities for land and land resources. UNEP and FAO will continue assisting developing countries and countries in transition, upon their request and whenever resources become available, in formulating and implementing their national policy frameworks.

39. FAO, which is a Task Manager for the UN system for the implementation of Chapter 10 (Integrated Planning and Management of Land Resources) of Agenda 21, was reported to have prepared in 1995 a background paper entitled "Planning for Sustainable Use of Land Resources: Towards a New Approach", the contents of which are relevant to the Commission's recommendations. The publication highlights such issues as land-use planning and management, links between rural, peri-urban and urban land use, land tenure, land rights and land markets, and qualities and limitations of land for different uses, and formulates some principles of an integrated approach to land management. It was reported that FAO, with funding from UNEP, had planned to organize a workshop which was to result in a first version of a new integrated approach. In the International Atomic Energy Agency (IAEA), isotope techniques are regarded as invaluable tools for determining the best methods for integrated land management and sustainable agroforestry. IAEA aims to transfer technologies for estimating soil erosion to help formulate appropriate erosion control policies. Other technologies help identify and select plant genotypes capable of increased nutrient acquisition and develop integrated plant nutrition systems to maximize yield response and reduce environmental contamination and degradation of natural resources. AEA also assists in the development and application of agricultural countermeasures to areas suffering radionuclide contamination. These activities receive backstopping for the joint FAO/IAEA Division.

40. Strengthening R&D systems for building innovative capacities and support to technological capacity-building projects. The activities of the Department for Policy Coordination and Sustainable Development (DPCSD) have concentrated on the development and transfer of environmentally sound technologies (ESTs). The report on transfer of environmentally sound technologies, cooperation and capacity-building prepared by DPCSD in 1996 for the fourth session of the Commission on Sustainable Development (E.CN.17/1996/13) pointed, in particular, to the possibilities of supplying national technology needs assessment as a tool for facilitating and possibly accelerating the development, adoption and diffusion of ESTs. The assessment process represents an opportunity for entering into a national dialogue on socio-economic and environmental strategies and for participating in the planning and execution of capacity-building actions regarding the introduction of ESTs. Assessment studies have been carried out jointly by the Netherlands and Costa Rica and by Switzerland and Pakistan, and the European Commission had been considering a similar initiative in Tunisia. Other relevant activities undertaken by bilateral and multilateral donors were also reported. The African Regional Centre for Technology (ARCT), DPCSD and the Economic Commission for Africa (ECA) jointly organized an African regional workshop on technology needs assessment in support of the transfer of ESTs and technology cooperation (Dakar, 17-19 January 1996). National and local cleaner production centres are beginning to play a major role in establishing nationwide cleaner production networks, coordinating cleaner production programmes, acting as an interface among industry, Governments, universities and NGOs, and disseminating information. A Best Practice Guide for Cleaner Production in Central and Eastern Europe has been prepared by OECD. The role of the Asian and Pacific Centre for Transfer of Technology of the Economic and Social Commission for Asia and the Pacific and of UNIDO in promoting cleaner production centres was outlined. A number of specific measures have been identified to assist small and medium-sized industries in adapting cleaner production techniques, including the adoption of

environmental management standards and practices, promotion of partnerships between the private and public sectors, development of EST information systems, and promotion of technology needs assessment projects and of cleaner production centres.

41. With respect to work in the area of technological capacity-building, ECA reported having organized and participated in the First African Regional Conference on Science and Technology in Addis Ababa, Ethiopia, in November 1995. The Regional Conference adopted a comprehensive resolution on building an enabling environment and capacities for science and technology development and application; a second meeting of the Conference is due in September 1997. ECA also co-organized and participated in the First Meeting of the West African Subregional Conference on Science and Technology which was held in Yamoussoukro, Côte d'Ivoire, in May 1996, and which adopted a draft subregional policy and a number of related priority projects, including one on training of research managers. ECA further organized a training seminar on "Incentives for the Development and Application of Science and Technology in Africa" (Ghana, June 1995), and an "Expert Group Meeting on Sample Legislations for Implementing Science and Technology Policies in Africa" (United Republic of Tanzania, September 1996). It has provided a number of advisory services to member States on the formulation and implementation of science and technology policies (Congo, August 1995; Namibia, March 1996; Guinea, May 1996; Botswana, April and June 1996; South Africa, September 1996; Guinea-Bissau, October 1996; Rwanda, October 1996). ECA has continued to cooperate closely with the African Regional Centre for Technology (ARCT), for which it carried out a study to strengthen the Centre's management capacity, and with the African Institute for Economic Development and Planning (IDEP) on a project to promote science and technology policy dialogues in member States. These activities aimed at strengthening the capacity of member States to formulate and implement science and technology policies in the region. In order to sensitize the international community to the specific problems facing Africa in science and technology, ECA also participated in a Regional Seminar on Food Irradiation (Morocco, March 1996) and in an International Seminar organized by the New York Academy of Sciences (April 1996). The regional commission has a representative on the Steering Committee of the African Technology Policy Studies Network (Zimbabwe, October 1996) and was planning to take part in the African Regional Standards Organization (ARSO) Accreditation Committee (Cairo, Egypt, November 1996) in order to provide inputs and better coordinate the activities of ECA with those of IGOs and NGOs in the field of science and technology.

42. In ECE, the meetings of the Senior Advisers to ECE Governments on Science and Technology (SAST) have provided a unique forum for the exchange of experience in this field between Western European countries and European economies in transition. These issues have generally been discussed during periodic reviews of major changes in national science and technology policies; more specifically, a number of specialized seminars and workshops have been held under SAST auspices. In November 1995, a workshop on industrial policy in Hungary was held in Budapest and considered, among other things, issues of support for corporate R and D innovation. The workshop was designed to provide assistance to the Hungarian authorities in finalizing the concept of a national industrial policy, which was subsequently approved by the Hungarian Government. In June 1996, a seminar on state policy in economies in transition aimed at encouraging innovation in industry was held in Poland and allowed for the discussion of aims and problems of an innovation policy, the instruments supporting this policy and the role of international cooperation in encouraging innovation. Two more such events are planned to be held under SAST auspices. The Russian Federation confirmed its intention to host in 1997 or 1998 a seminar on the reorganization of the system of management of science and technology under the new economic and political conditions. The Latvian authorities decided to host a workshop on facilitation of the implementation of R&D results in autumn 1997.

43. In ECLAC, the Joint ECLAC/UNIDO Industrial Development Unit, through the ECLAC/UNDP Regional Project on Innovation and Competitiveness Policies (RLA/88/039), has been providing technical assistance to Governments in the region since 1990 in respect of technological development policies and the strengthening of governmental agencies in charge of science and technology. Technical assistance pertinent to paragraph 7 of the Economic and Social Council's resolution 1995/4 has been provided, either directly to science and technology agencies or via support for institutions in charge of designing competitiveness policies in the region, including innovation support and aspects relating to technology diffusion. Technical assistance through either modality has been provided to Bolivia, Brazil, Chile, Colombia, the Dominican Republic, Jamaica and Venezuela.

44. Since 1993, the secretariat of the United Nations Conference on Trade and Development (UNCTAD) has provided substantive support for the work of the Commission on Science and Technology for Development, particularly in areas referred to in resolution 1995/4. This has been done through support to intergovernmental deliberations, policy-related research and technical cooperation. A full account of relevant work accomplished over recent years is contained in document TD/B/COM.2/Misc.2, presented to the first session of UNCTAD's Commission on Investment, Technology and Related Financial Issues. Activities undertaken include the organization, with support from the Government of the United Kingdom, of a Workshop on Selected Cooperation Aspects for Technological Capacity-building in Developing Countries, which was held in April 1995. On the basis of material presented at the Workshop, the secretariat prepared a publication entitled "Technological Capacity-building and Technological Partnership: Field Findings, Country Experience and Programmes". A Meeting of Experts on Technology Partnership for Capacity-building and Competitiveness was also held in Helsinki in April 1996 with support from the Government of Finland, and its report was submitted to UNCTAD IX at Midrand. Other work included the preparation of a publication entitled "New Technologies and Technological Capability-building at the Enterprise Level: Some Policy Implications". This study shows that, while the emergence of new technologies creates new challenges, it also opens up new windows of opportunity for latecomers to industrialization. A number of other studies have also been prepared and should be published shortly in a book entitled "Technological Capability-building and Export Success: Studies from Asia" (Routledge, 1997).

45. The secretariat has continued to provide substantive support to the Commission's work on information technology, including the organization of several meetings of its Working Group on this subject. Relevant to the work on information technology was the preparation by the secretariat of the tenth issue of the ATAS Bulletin dealing with information technology for development.

46. Further to the request by the Commission and UNCTAD IX, in 1996 UNCTAD started the implementation of a programme of science, technology and innovation policy reviews for interested countries. Such a review has been implemented for Colombia and is currently being implemented for Jamaica. Several other countries have expressed their interest in this exercise. A progress report on country reviews has been prepared by the secretariat for the third session of the Commission, along with the above-mentioned notes on consideration of ways and means of commemorating the Vienna Conference on Science and Technology for Development, on sustainable energy systems and on coordination of work.

47. UNEP, in cooperation with UNIDO, has been operating the National Cleaner Production Centres project aimed at building country capabilities for carrying out cleaner production activities, including training, information dissemination and technology transfer. There are currently nine such centres worldwide. To catalyze

information exchange and international cooperation, the centres network through e-mail, newsletters and annual meetings. Within the framework of UNEP's role as an implementing agency of the Multilateral Fund for the Implementation of the Montreal Protocol, UNEP's Industry and Environment OzonAction Programme has provided developing countries with institutional support projects for Governments' National Ozone Units. UNEP, through the Environmental Information Networking component, has continued to facilitate the collection, exchange and dissemination of environmental information between countries and regions for the collaborative assessment of key environment and development issues, provided for a global network of environmental data centres and for information exchange and a referral system of information sources, and promoted the development of national and subregional capacities in data and database management to support state-of-environment assessments in developing countries and countries in transition. The UNEP International Environmental Technology Centre (IETC) has developed a capacity-building strategy focusing on the design and implementation of pilot programmes with a regional and subregional scope which has contributed to improved environmental management practices of urban areas and freshwater resources. These activities followed the emphasis given by Agenda 21 and the latest General Assembly resolution on science and technology to capacity-building in developing countries and countries in transition to utilize resources in a sustainable manner.

48. FAO considered that strong and effective national agricultural research systems (NARSs) for the generation and transfer of appropriate technologies are a must to trigger sustainable agricultural development. It has assisted NARSs of member countries to mobilize all available resources in a coherent way and develop partnerships and functional linkages among relevant national, subregional, regional and international institutes to attain their goals. Effective partnerships and linkage mechanisms are addressed by FAO at the following four levels: (1) strengthening linkages among NARSs elements; (2) strengthening linkages between national agricultural research institutes (NARI) and extension services and farmers; (3) strengthening inter-NARSs partnerships and their regional and subregional fora; and (4) fostering the development of functional partnerships between NARSs and the global research community.

49. IAEA has shifted the focus of its technical cooperation operations from capacity-building aimed at scientific institutions to a development assistance approach seeking to support socio-economic and human development priorities in member States. At the same time, IAEA has continued to support scientific and technological capacity-building by implementing technical co-operation projects, co-ordinating international research projects and training manpower. In 1995, IAEA delivered technical co-operation services worth US$ 63 million. IAEA's area of expertise covered the application of nuclear science and technology related to a wide array of development areas, including human health, food security, sustainable energy supply, water resource management and environmental protection. IAEA also carried out several projects to help countries link up to INIS - the International Nuclear Information System.

50. The International Civil Aviation Organization (ICAO) has assisted a number of developing countries, including least developed countries, in implementing projects designed to foster technological capacity-building. For example, in Indonesia, ICAO assisted the Government in building its technical capacity to design, produce and certify the N-235 aircraft; in India, it helped in the preparation of an action plan for the implementation of a new Air Navigation System; in Myanmar, ICAO activities included the enhancement of Myanmar's technical capacity to provide a safe and modern air traffic control system; in Botswana, ICAO's activities were concentrated on sustainable human development aspects of Botswana's Civil Aviation Authority, as well as the establishment of a training unit in the authority; in Ethiopia, ICAO assisted the Government in strengthening its capacity in the work of rebuilding Addis Ababa airport; and in Somalia, it provided emergency technical co-operation for the

transition of air traffic control, fire and rescue and other critical civil aviation services from UN military command to the Civil Aviation Authority, as well as assisting in the rehabilitation of the infrastructure at Mogadishu International Airport.

51. The International Maritime Organization (IMO), through its Integrated Technical Cooperation Programme, has provided assistance to developing countries in building up or upgrading national capabilities for maritime safety, marine environment protection and rehabilitation; development and harmonization of maritime legislation (including integration of international conventions into national law); development of capabilities for port State control and training of ship inspectors; development of regional and national marine emergency response capabilities, including the establishment of centres for response, information and training; setting up and upgrading existing vessel traffic services and search and rescue co-ordination centres; and development and management of port reception facilities.

52. The United Nations Industrial Development Organization (UNIDO) reported on a wide range of activities, including technical cooperation programmes, relevant to the Commission's recommendations. Its work is aimed at supporting Governments in their efforts to address the many facets and issues of technology policy conducive to innovation in infrastructure and in the private sector for greater participation in global technological developments and sustainable competitiveness. At an Expert Group Meeting organized by UNIDO's Technology Service, held in Vienna in November 1995, a thorough evaluation of opportunities for competitive industrialization and sustainable development was carried out. Through publications and on-line services, UNIDO has kept developing countries informed of developments and trends in advanced and new technologies. UNIDO has also helped develop national and regional capabilities in monitoring and evaluating technology and in securing technology inflows and channelling them, in particular through the use of such tool as Techmarts, or technology markets. UNIDO has also sought to strengthen technology acquisition capabilities of developing countries by facilitating access to appropriate information and improving the skills of local consultants who cater to the needs of technology buyers. A Manual on Technology Transfer Negotiation was recently prepared for use at seminars and workshops. UNIDO's build-operate-transfer (BOT) mechanism aims at using the potential of international business partnerships to enhance the host country's technological capability. The organization has further provided assistance to developing countries in designing policy frameworks in such areas as biotechnology, materials technology and energy technology. It offers expertise to developing countries and countries in transition to facilitate the conceptualization, launching and development of technology-based enterprises. With a view to facilitating the strengthening of national innovations systems, UNIDO has initiated assessment of such systems through advisory services to policy-makers. Over the past few years, UNIDO has established several centres of excellence for research and training, including centres in Trieste (Italy), in Perth (Australia) and in Taejon (Republic of Korea), and assisted in the revitalization/restructuring of R&D centres in more than 10 developing countries. Technology transfer support at the level of industrial subsectors has concentrated on the transfer of cleaner technologies and the introduction of modern quality management systems in such sectors as leather, wood, textiles, pharmaceuticals, rubber and petrochemicals. UNIDO has also contributed to enterprise-level technological cooperation, in particular in the context of South-South cooperation.

53. Access to information technology networks by scientific and technical institutions in developing countries and countries with economies in transition and the facilitation of appropriate electronic communication among institutions engaged in science and technology for development. Various international organizations reported on relevant activities. ECA was reported to be active throughout Africa and to be involved in developing electronic communications and databases of common interest. In

an effort to explore the relationship between the Internet and rural development, FAO sponsored a fact-finding mission in collaboration with the Department of Rural Extension Studies at the University of Guelph, resulting in a report entitled "The Internet and Rural Development". The report outlines the elements of a communication-for-development approach applied to the Internet and rural development, together with recommendations for a stratgy and activities and an overview of Internet activities in developing countries. It contains a series of pilot project proposals, which, together with the recommendations, may be of interest to other development agencies which have or are interested in supporting activities focused on developiping Internet infrastructure and applications in developing countries. UNU/INTECH has developed a global technology and economic development (GLOB-TED) database, which contains data on several indicators of technological and economic development in over 130 industrialzied and developing countries for a few points in time. Electronic networks using the Internet feature the Zero Emissions Research Initiative (UNU/ZERI) activities, one of which is the Integrated Biosystems Network enabling 210 experts to participate electronically. To assist developing countries in meeting needs and strengthening local capacities in software technology, the UNU International Institute for Software Technology (UNU/IIST) concentrates on advanced software development and postgraduate training and fellowships. Advanced development projects include: design techniques for real-time, reactive and hybrid systems; railway computing systems, specifically for rescheduling of trains; manufacturing industry information and command infrastructure systems; multilingual script systems; air traffic control support systems; digital multiplexed telephone systems. UNU/IIST provides postgraduate and postdoctoral workshops of one to three weeks' duration on the most advanced software technology development techniques in the priority areas of UNU/IIST. In 1996, 18 such courses were organized in Macau, China, Viet Nam, India, the Philippines, Mongolia, Belarus, Russian Federation, Romania, Poland, Brazil, Argentina and Gabon. In addition, training of trainers is being strengthened. UNU has, since 1983, been undertaking a training and research project in microelectronics and related areas jointly with the International Centre for Theoretical Physics (ICTP) and with financial support from the Government of Italy. With the aim of helping developing-country universities and research institutes to strengthen their scientific and technical capabilities in microinformatics, as in the past, various training courses and workshops were held in 1996. Under the framework of the Agreement of Cooperation between UNU, the University of Yaoundé and the National Informatics and Automation Research Institute (INRIA) of France, efforts have been made since 1984 to strengthen the capacity of the Computer Science Department of the University of Yaoundé as a regional centre of excellence in microinformatics and to promote regional cooperation in computer science.

54. IAEA was reported to be involved with several projects to put more of its technical and scientific data on the Internet in order to make it available *inter alia* to institutions in developing countries. The International Nuclear Information System (INIS) database is being made available both on CD-ROM disks and via the Internet, which will improve access by developing countries, and INIS, through technical co-operation projects, has supplied over 100 Pcs to the INIS Centres in developing countries. Other INIS information is to be made available via the Internet by the end of 1997. Other projects are underway to put more technical and scientific information on the agency's Internet services. IAEA has been supporting several technical cooperation projects that facilitate the application of science and technology by making scientific and technical information available in developing countries, in particular the "Nuclear Information System Project" completed in December 1996, whose objective was to produce a regional system of nuclear information centres that will permit the sharing of information resources. ECA was reported to be active throughout Africa and is developing electronic communications and databases of common interest. It will strengthen library and information transfer systems as they relate to nuclear S&T and will promote the establishment and improvement of national information networks

in connection with national S&T development programmes. Another project is being implemented in Belarus with the objective of assisting that country in public information activities relating to nuclear S&T and also of facilitating access to and use of Internet.

55. UNIDO's Industrial Information Programme undertakes the development of regional, subregional, national and sectoral (e.g. energy, environment, informatics, new materials and biotechnology) information networks with a view mainly to securing developing countries' access to specific information on advanced and appropriate technologies. The networks are designed to facilitate and accelerate the cost-effective flow of relevant information to users in developing countries of UNIDO's Industrial and Technological Information Bank (INTIB) and to promote UNIDO activities and services. INTIB maintains databases with information including technology offers and requests, and joint venture opportunities; industrial development: abstracts of reports, studies, etc., and directories of R&D centres and other information sources; technology transfer agreements; industrial energy saving; clean technology; materials technology; and food science and technology. The programme assists developing countries to directly access information sources and networks, thereby increasing the capability of developing countries to use modern communication techniques for information access and analysis of techno-economic information gathered. It aims at establishing a network of monitoring support with government, national scientific and technological development institutions and industry in developing countries.

56. With a view to supporting networking activities in developing countries, in September 1995 the World Bank launched the Information for Development Programme (*info*Dev). *Info*Dev is a global programme managed by the Bank to help developing countries benefit fully from the innovations in, and applications of, information technology. Donor pledges from Governments, multilateral institutions and the private sector amounted to $4.5 million by September 1996. The programme provides grants for proposals approved by the *info*Dev evaluation process (most of these grants are under $250,000 per project). More than 150 proposals have been submitted to *info*Dev since 1995, and several projects are already under way. The issues of Internet connectivity and training in the context of S&T communities in developing countries have been the focus of numerous proposals that are now being evaluated. In November 1995, the Finance and Private Sector Development Vice-Presidency of the World Bank (FPDVP) launched the Technology Network (TechNet). TechNet is a networking programme that delivers information for development and helps to develop S&T-related projects. TechNet is developing the methodology for "Knowledge Assessment" reports designed to evaluate the ability of developing countries to secure and diffuse scientific and technological knowledge and to put it to productive use. TechNet also sponsors conferences, seminars, publications and Internet-moderated conferences focusing on S&T for development.

57. Coalition of resources for science and technology for development. In considering the question of coalition of resources, the Commission on Science and Technology for Development at its second session recognized the generally diminishing level of donor resources available for development cooperation in general and science and technology in particular. In that regard, the Commission welcomed the outcome of the Consultative Meeting on a Coalition of Resources for Science and Technology for Development, which had included a call for multiple coalitions of resources. The Commission recognized that, given the shortage of funds available for science and technology for development, support for good projects identified might be requested from the regional and interregional programme funds that were provided by various international funding sources, particularly the United Nations Development Programme through its Governing Council. One idea that might be proposed for funding is the setting-up of science and technology country policy dialogue projects aimed at

improving national science and technology policies, in which the involvement of funding agencies and the regional economic commissions would be essential. A coordinating role for the Commission could be to stimulate global thinking and system-building on chosen topics, such as information technology, in order to devise programmes of a multilateral nature that would be instrumental in mobilizing resources from all available sources.

58. The Economic and Social Council, at its substantive session of 1995, took note of the recommendations adopted at the Consultative Meeting on a Coalition of Resources for Science and Technology for Development (New York, December 1994) and agreed that, at the international level, a coalition of resources should focus on specific themes and common goals among recipients, donors and international financing institutions, including the World Bank and the regional development banks. Such themes and common goals should be based on voluntary and informal mechanisms that promote the full interaction of both donors and recipients. The Council also recommended that the Commission on Science and Technology for Development should provide a forum for exchanging views and interaction among partners of different networks and coordination schemes. Such a forum could be held either as a segment of its biennial sessions or as an intersessional activity, as required and defined by the Commission on Science and Technology for Development in consultation with relevant United Nations entities and international organizations (paragraph 15 of resolution 1995/4).

59. The UNCTAD secretariat, in its request to Governments members of the Commission and international organizations, invited them to provide any information and suggestions on the issue of coalition of resources.

60. In response to this, ECA reported that it was working closely with the African Foundation for Research and Development (AFRAND) and the Research and Development Forum for Science-Led Development in Africa (RANDFORUM), two African NGOs involved in the funding and management of science and technology. It was also collaborating with a number of donors in order to raise some funds to carry out extrabudgetary projects of significance in priority areas. ICAO was of the opinion that in the area of coalition of resources, particularly as concerns international financial institutions, focus on common goals among recipients must be ensured. To this end, ICAO, particularly in view of the drastic decline in UNDP funding for civil aviation projects, has made concentrated efforts in terms of offering to the World Bank and regional development banks its expertise in the planning and management of civil aviation projects funded by them. This effort has had limited success so far. Similar efforts have also been made with other international institutions, such as the European Union and the African, Caribbean and Pacific Group of States. IMO reported that its technical co-operation programme has for some time experienced serious financial constraints. These are not unique to IMO, and the Administrative Committee on Coordination (ACC) has noted the lack of funds and drawn attention to the special needs of the smaller technical agencies such as IMO, which have no budgets of their own for technical co-operation, nor independent representation in the field. The IMO programme, which grew thanks to the financial support of UNDP and a few donor countries, has experienced a considerable reduction in the international funds previously available due to the policy changes introduced in UNDP and the financial difficulties of the donor States. IMO, in fact, has seen the UNDP contribution to its programme decline from US$ 6 million in 1988 to US$ 1.5 million in 1995. Efforts to attract donor financing and cost-sharing with other organizations are being pursued vigorously in an effort to increase the coverage and impact of the Integrated Technical Co-operation Programme of IMO. At its nineteenth session in 1995, the IMO Assembly took a decision to enable the Organization to provide some seed funding for projects through an internal Technical Co-operation Fund. In the opinion of IMO, the General Assembly may help by drawing the attention of donors to the comparative advantages of the United Nations system, inherent in its universality, neutrality, multilateralism and internationally agreed objectives. This

and closer partnerships with UNDP and other organizations, including the Bretton Woods institutions, may help to provide access to adequate levels of resources.

61. The Bureau of the Commission, at its meetings held after the second session (Maastricht, August 1995; Bosch-en-Duin, November 1995; Islamabad, March 1996, Bucharest, November 1996; Bombay, January 1997) discussed in detail the recommendations of the Commission, as endorsed by ECOSOC. It was felt that the complex issue of coalition of resources would require a more thorough analysis that would go beyond the work already accomplished by the above Consultative Meeting on a Coalition of Resources. It was considered useful to undertake an in-depth study of mandates of various donors which would serve as a basis for a meeting with the participation of these donor agencies and all interested international organizations. Given that the preparatory activities for the above meeting, including the preparation of the study, will require considerable extrabudgetary resources and the fact that such resources were provided by the Government of the Netherlands at the end of 1996, it was suggested at the Bureau meeting in Bombay (January 1997) to organize these activities after the third session of the Commission.